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6600 SERIES

MICROWAVE SWEEP OSCILLATOR PLUG-IN

Instruction Manual

MP MASTER
MA23596

INSTRUCTION MANUAL

MICROWAVE SWEEP OSCILLATOR PLUG-IN UNIT 6600 SERIES

Model .....

Serial No. .....

Frequency Range .....

Power Output .....

Levelled Power Variation .....

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DETAILS OF MICROWAVE COMPONENTS

Microwave Tube:	Type .....
	Manufacturer .....
	Model No .....
	Serial No .....
	Cathode current .....
	Filament current .....
	Max. helix current .....
	Injection electrode voltage .....
Directional Coupler:	Manufacturer .....
	Model .....
	Serial No .....
Detector:	Manufacturer .....
	Model .....
	Serial No .....
Diode Modulator:	Manufacturer .....
	Model .....
	Serial No .....

CAUTION

The power level at the RF output terminal may exceed the power rating of standard detectors. This power level can cause burn-out of crystal diodes and power meter elements. The operator should therefore insert an appropriate amount of attenuation when this instrument is used with crystal detectors, thermistor mounts, bolometers, etc.

"As we are always seeking to improve our products, the information in this document gives only general indications of product capacity, performance and suitability, none of which shall form part of any contract."

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When returning instruments for repairs, or for any other reason, please contact this Company for shipping instructions. To expedite repair service, it is important to provide type number, serial number, and a detailed description of the reason for the return of the instrument.

SPECIFICATION CHANGES

The Company reserves the right to change any specifications noted herein without prior notice.

GENERAL DESCRIPTION

The plug-in Oscillator Unit is used in conjunction with a Basic Unit 6600A. When inserted into the Basic Unit, the equipment will meet the specification listed in Section 2 of this manual.

1.1 PLUG-IN OSCILLATOR UNIT INTERCHANGE

The following steps should be taken to change the frequency band of operation from range A to range B.

(a) Remove the four knurled nuts holding dial scale A to the front of the Basic Unit and remove the scale.

(b) Remove the two screws holding dial scale B to the side of Oscillator Unit B, and lift off the scale. Replace the two screws.

(c) Place scale B on the Basic Unit front panel and fasten it with the four knurled nuts.

(d) Turn the POWER switch to OFF.

(e) Give the thumb-screw on the front of Oscillator Unit A 2-3 turns counterclockwise and withdraw this unit by pulling on the thumb-screw.

(f) Turn the thumb-screw on Unit B one turn counterclockwise, insert this unit into the Basic Unit, and turn the thumb-screw clockwise until it is tight.

(g) Turn the POWER switch to R.F. OFF or R.F. ON, depending upon the urgency at the time.

(h) Remove the two scale securing screws from the side of Oscillator Unit A, position the scale over the studs, and replace the screws.

The equipment is now ready for use on frequency band B.

TABLE 1 – RANGE OF OSCILLATOR UNITS AVAILABLE

	GRID LEVELLED				DIODE LEVELLED				
		Internal directional detector				Internal directional detector			
		without	with			without	with		
Frequency Range (GHz)	Min. Power* Output (mW)	Type	Type	Levelled Power Variation (dB)	Min. Power* Output (mW)	Type	Type	Levelled Power Variation (dB)	Remarks
0.2 - 0.4	–	–	–	–	20	6601	–	–	Voltage tuneable magnetron
0.25 - 0.5	–	–	–	–	50	6602	–	–	Voltage tuneable magnetron
0.35 - 0.7	–	–	–	–	100	6603	–	–	Voltage tuneable magnetron
0.4 - 1.2	–	–	–	–	20	6604	–	–	Voltage tuneable magnetron
0.5 - 1.0	–	–	–	–	100	6605	–	–	Voltage tuneable magnetron
1 - 2	100	6608	6609	±0.3	60	6610	6611	±0.3	Backward wave oscillator
1.4 - 2.5	100	6612	6613	±0.3	60	6614	6615	±0.3	Backward wave oscillator
1.7 - 4.2					15	6618	6619	±0.5	Backward wave oscillator
2 - 4	80	6620	6621	±0.5	40	6622	6623	±0.5	Backward wave oscillator
3.5 - 6.75	40	6624	6625	±0.5	25	6626	6627	±0.5	Backward wave oscillator
3.7 - 8.3					8	6630	6631	±0.5	Backward wave oscillator
4 - 8	30	6632	6633	±0.5	20	6634	6635	±0.5	Backward wave oscillator
7 - 11	25	6636	6637	±0.5	10	6638	6639	±0.5	Backward wave oscillator
7 - 12.4	25	6640	6641	±1.0	10	6642	6643	±1.0	Backward wave oscillator
8 - 12.4	50	6644	6645	±0.75	25	6646	6647	±0.75	Backward wave oscillator
10 - 15.5	20	6648	–	–	10	6657	–	–	Backward wave oscillator
12.4 - 18	40	6649	–	–	15	6658	–	–	Backward wave oscillator
18 - 26.5	20	6650	–	–	–	–	–	–	Backward wave oscillator
26.5 - 40	10	6651	–	–	–	–	–	–	Backward wave oscillator
4.8 - 9.7	20	6658	–	–	–	–	–	–	50 Ω Type N Female
8 - 18	8	6667	–	–	–	–	–	–	50 Ω Type N Female
15 - 22	5	6670	–	–	–	--	–	–	Square flange
2 - 4.5	–	–	–	–	30	6673	6674	±0.5	50 Ω Type N Female
7 - 13	12	6676	–	–	–	–	–	–	50 Ω Type N Female

* Minimum Power Output is 1dB less with internal directional coupler.

SECTION 2

SPECIFICATION

R.F. FREQUENCY RANGE: the frequency range covered by this unit is as indicated at the front of this manual.

R.F. POWER OUTPUT: the power output is as indicated at the front of this manual.

SWEEP PRESENTATION:

(a) END LIMIT: between any two frequencies in the band.

(b) MARKER END LIMIT: between any two frequencies in the band.

(c) SYMMETRICAL: calibrated and adjustable from 0 to 100% of the frequency band covered.

(d) EXTERNAL: direct-coupled with sensitivity 20 volts for full sweep. Positive voltage change increases RF frequency.
Response time: 200 micro-seconds for full sweep with increasing frequency, and 2 milli-seconds for full sweep with decreasing frequency.
Provision for external resistance control

(e) CW OPERATION: Four independent single frequencies, calibrated and continuously variable.

MARKERS: Two independent adjustable markers displayed either as dips in RF output or externally as video pips.

ACCURACY: BWO units - ± 1%; VTM units ± 1.5%.

RESOLUTION: less than 0.05% of sweep range.

AMPLITUDE: continuously variable.

OUTPUT: amplitude of auxiliary video marker, 5 volts.

SWEEP RATE: decade switch settings from 10 seconds to 0.01 sec. sweep time with vernier adjustment for up to ten times prolongation.

TRIGGERED SWEEP:

(a) INTERNAL: recurrent.

(b) LINE: at power supply frequency.

(c) EXTERNAL: a 10 volt negative input signal will initiate sweep.

(d) MANUAL: front panel push button.

SWEEP OUTPUT: direct-coupled, adjustable from 0 to 15 volts peak.

PROPORTIONAL OUTPUT: direct-coupled voltage proportional to instantaneous frequency, 0 volts at low end and +18 to +40 volts (pre-settable) at high end.

BLANKING OUTPUT: 5 volts negative, available during sweep retrace.

PEN LIFT FACILITY: relay contact closure during forward trace portion of sweep.

BASE LINE: switch selects R.F. ON or OFF during retrace.

FREQUENCY STABILITY:

(a) RESIDUAL FM: BWO units - 2 ppm peak during CW operation.
VTM units - 10 ppm typical.

(b) LINE REGULATION: ± 5 ppm maximum for ± 10% change in supply voltage.

LEVELLED RF OUTPUT: internal feedback amplifier maintains output power variation to within 0.1dB plus coupler and detector variation. When operated with an internal directional coupler, power variation is as stated at the front of this manual.

All Oscillator Units may be operated with an external directional coupler and crystal detector with negative output, or with a power meter which provides a negative output signal.

MODULATION:

(a) INTERNAL AM: square-wave modulation, adjustable from 950 to 1050 Hz.

(b) EXTERNAL AM: 20 volt positive signal increases RF to maximum. Rise and fall times for BWO units are 0.1 micro-second (unlevelled) and approximately 10 micro-seconds (levelled).

For VTM units, the corresponding figures are 1.0 and 10 micro-seconds.

(c) EXTERNAL FM (BWO units): direct-coupled input provides frequency response in excess of 5 MHz.

RESIDUAL AM: 40dB below RF output.

GENERAL:

DIMENSIONS: Complete equipment -

Height $8\frac{3}{4}$" (22.2 cm.)
Width $17\frac{1}{2}$" (43.8 cm.)
Depth $21\frac{1}{8}$" (53.3 cm.) over all
Weight 57 lb. (25.8 Kg.) to 63lb. (28.5 Kg.)

Plug-in Oscillator Unit only

Height 5.1/8" (13.0 cm.)
Width 7" (17.8 cm.)
Depth 18" (45.8 cm.)
Weight - ranging from 12 lb. (5.4 Kg.) to 18 lb. (8.1 Kg.) depending upon frequency band.

Rack mounting adaptor brackets are available.

AMBIENT OPERATING TEMPERATURE: -10°C to +50°C.

POWER SWITCH: OFF, R.F. OFF, R.F. ON.

Thermal delay (or alternative electronic delay) prevents premature application of high voltages to oscillator tube if this switch is moved directly to "R.F. ON".

POWER INPUT: 105 to 125 volts, or 210 to 250 volts, 50 - 65 Hz.

Consumption approximately 150 VA.

400 Hz. operation to special order.

SECTION 3

PRINCIPLE OF OPERATION

(Refer to Section 3 in the Basic Unit Instruction Manual)

SECTION 4

CONTROLS

4.1 SYMMETRICAL SWEEP WIDTH.

In each switch position the sweep width is indicated by the panel calibration. When this switch is in the extreme clockwise position, the potentiometer concentric with it is operable and can be used to vary the sweep width continuously from zero to 100% (if the mid-sweep frequency is at mid-band).

4.2 R.F. LEVELLER

In the XTAL INT. position, the amplitude of the RF output is maintained constant, independent of the RF frequency, by means of the internal feedback levelling system. This description does not apply to Oscillator Units which have no internal levelling components. In these units, the RF LEVELLER switch is prevented from rotating into the XTAL INT. position.

In the XTAL EXT. position, the feedback levelling amplifier operates with an external directional coupler and detector. The detected output is connected to the EXT. DETECTOR INPUT on the front panel of the Oscillator Unit and should be of negative polarity.

In the OFF position, the RF output is unlevelled.

In the PWR. MTR. position, levelling is achieved in the same manner as in the XTAL EXT. position except that a power meter is used instead of the crystal detector. The recorder output of the power meter is connected to the EXT. DETECTOR INPUT terminal. When using a power meter, the operator should restrict the sweep speed to the slowest ranges because of the slower response time of the power meter sensing element.

4.3. R.F. LEVEL

This control varies the RF output amplitude. With the R.F. LEVELLER switch in the OFF position, the RF amplitude can be varied from zero to maximum, but it will be unlevelled across the band. With the R.F. LEVELLER set to XTAL INT, XTAL EXT. (with an external directional detector), or PWR.MTR (with a power meter) position, the R.F. LEVEL control sets the maximum level of the RF amplitude across the band.

In those portions of the band where there is sufficient RF power to reach the level demanded by the setting of the RF LEVEL control, the output will be levelled. In those portions of the band where there is insufficient RF power available, the output will be unlevelled. This situation is revealed by the UNLEVELLED indicator light.

The operator can therefore set the R.F. LEVEL control so that a levelled output is obtained across the entire frequency range of the unit, or he can set this control to obtain a higher levelled output over a portion of the range where higher RF power is available.

When the R.F. LEVELLER is in the PWR. MTR. position, the circuit is arranged so that RF power is never switched off during the retrace portion of the sweep cycle.

SECTION 5

INPUTS

5.1. EXTERNAL DETECTOR INPUT.

Provision is made for use of an external directional coupler and detector having an output of negative polarity together with the internal feedback levelling amplifier in the Oscillator Unit. When using this configuration, however, attention must be paid to meeting the stability requirements of the feedback loop. This is done by connecting the output of the detector to the EXT. DETECTOR INPUT terminal and adjusting the GAIN control.

The GAIN control is located on the front panel of the Oscillator Unit and is a screwdriver adjustment. With the unit sweeping over the whole of its frequency range, the R.F. LEVELLER set to EXT., and the R.F. LEVEL control turned fully clockwise, the GAIN control should be adjusted so that levelling just begins at the peak power points.

5.2. FM INPUT*

A signal applied at this input terminal is direct-coupled to the helix of the BWO. This enables very rapid frequency modulation of the R.F. output to be carried out.

The capacity at this input point is a few hundred picofarads. Using a video generator with a 50 ohm source impedance, the bandwidth is approximately 5 MHz.

The maximal signal level which should be applied at this input is ± 20 volts. The modulation sensitivity (in MHz per volt) will be different for each frequency range and will depend on the particular portion of the band; this sensitivity is approximately 0.1% per volt.

5.3. AM PULSE INPUT.

This input can be used to couple pulses into the unit in order to obtain RF pulses at the output with rapid rise and fall times. The input signal is a.c. - coupled to the grid of the BWO tube in the case of grid-levelled models, and d.c. - coupled to the diode modulator in diode-levelled models.

In making use of this facility, the RF LEVELLER switch should be in the OFF position, and the RF LEVEL control should be adjusted so that no power is present at the output until the pulse is applied.

The input pulse amplitude should be increased (to approximately +20 volts peak) until maximum power is obtained at the peak of the pulse.

* Not applicable to plug-in Oscillator Units using a Voltage Tunable Magnetron (VTM)

SECTION 6

PROTECTIVE CIRCUITS

(Refer to Section 6 in the Basic Unit Instruction Manual for Model 6600 or Paragraphs 4-12 to 4-17 for Model 6600A)

CALIBRATION OF OSCILLATOR UNIT

A calibrated Basic Unit 6600 is required in order to carry out calibration of the Oscillator Unit. The bottom covers of both units should be removed; also the top cover of the Basic Unit. With the plug-in Oscillator Unit inserted into the Basic Unit, turn the POWER switch to R. F. OFF and allow a 15 minute warm-up period before proceeding with the calibration.

7.1 Test Equipment required.

(a) direct-coupled oscilloscope.

(b) d.c. voltmeter with accuracy $\frac{1}{4}$% or better and capable of floating at 3KV with respect to ground.

(c) frequency meter for the whole of the relevant RF band.

(d) microwave power meter with sensing head of known accuracy over the relevant band.

(e) d.c. milliammeter capable of floating at 3 KV with respect to ground.

7.2 Preliminary setting of controls:-

**	POWER	R.F. OFF
	AMPLITUDE MOD.	OFF
	1000Hz	MAX. CW
	SWEEP TIME (SECS)	0.1
	VARIABLE	MAX. CW
**	SWEEP MODE	F_1
**	MARKER AMPLITUDE	MAX. CCW
	TRIGGER	INT.
	M1	FL (see below)
	M2	LL (see below)
**	F_1	FL
	F_2	MAX. CW
	SYMMETRICAL SWEEP WIDTH	MAX. CW
	VERNIER	MAX. CW
**	R.F. LEVELLER	OFF
**	R.F. LEVEL	MAX. CW
*	HORIZONTAL SWEEP AMPLITUDE	MAX. CW
*	R.F. DURING RETRACE	OFF
*	INTERNAL MARKER	ON

FL: First scale calibration line (low frequency)

LL: Last scale calibration line (high frequency)

* These controls are located on the rear panel of the Basic Unit.

** Specific changes in these settings will be called for whenever required. For convenience these control settings are also tabulated in Figure 1.

HV CLAMP ADJUST	MAX. CW
LV CLAMP ADJUST	MAX CCW

Note: These two controls are located inside the Oscillator Unit. See Figure 3 for their location. They are accessible when the bottom covers of the Basic Unit and the Oscillator Unit are removed.

7.3. ADJUSTMENT STEPS

(a) D.C. FILAMENT ADJUST

Turn POWER switch to R.F. OFF.

CAUTION: The voltmeter and the adjustment are at kilovolt potential when the POWER switch is in the R.F. ON position.

Connect the voltmeter between terminals A and E on the printed circuit board (see Figure 3), with the positive lead of the meter going to A.

Adjust R216 "D.C. FILAMENT ADJUST" (located in the Basic Unit) for a voltmeter reading of 6.3 volts for a BWO unit or 5.6 volts for a VTM unit.

Having done this, disconnect the voltmeter.

For VTM Units only - with the aid of a pair of temporary leads going into the top of the Oscillator Unit, connect the voltmeter across R998 (1.0 ohm VTM requiring up to 2.5A of filament current or 0.5 ohm for VTM requiring over 2.5A) at points P and Q (see Figure 4), Q being positive.
Adjust R999 "FILAMENT CURRENT ADJUST" for a voltmeter reading V_r

where $V_r = 1.0 \times I_f$ for units requiring up to 2.5A.

or $V_r = 0.5 \times I_f$ for units requiring 2.5A or more.

I_f is the value of filament current specified for this tube as shown at the front of this manual (if applicable). It must always be ensured that the manual relates to the particular VTM in use.

Disconnect the voltmeter and the temporary leads and proceed to step (d).

(b) For BWO Units only

HELIX CURRENT MAXIMUM ADJUST

Connect a milliammeter and a 20K variable resistor as follows:-

(i) Meter NEG, to anode of CR808 (see Fig. 5 for location).

(ii) Meter POS. to one end of variable resistor.

(iii) Other end of resistor to B.W.O. connection F (see Fig. 3 for location.

Set the meter on its 10mA d.c. range and the variable resistor to maximum resistance.

Turn R974 fully clockwise and move the power switch to R.F. OFF.

Adjust the variable resistor to obtain a meter reading equal to that given for maximum helix current at the front of this manual.

Slowly turn R974 anticlockwise until the trip circuit operates.

Return the variable resistor to maximum; turn the power switch OFF and then back to R.F. OFF. Advance the variable resistor slowly while watching the meter until the trip operates.

The current should reach the desired level within 0.2mA. If it does not, re-adjust R974 slightly and repeat this paragraph.

Finally, switch off and disconnect test gear.

(c) BWO Units only

With the equipment still switched off, disconnect the CATHODE (yellow) lead of the BWO from terminal C.

Connect a milliammeter on its 10mA d.c. range between the yellow lead (positive) and terminal C (negative).

Turn R819 "ANODE VOLTAGE ADJUST" completely counter-clockwise.

CAUTION: FOR THIS ADJUSTMENT, SPECIAL CARE MUST BE EXERCISED AS BOTH THE VOLTMETER AND THE ADJUSTMENT ARE AT KILOVOLT POTENTIALS.

Turn the POWER switch to R.F. ON and wait for the delay to expire. Using an INSULATED SCREWDRIVER adjust R819 "ANODE VOLTAGE ADJUST" so that the cathode current is at the value indicated at the front of this manual. Ensure that this manual relates to the specific BWO installed.

Switch off completely, disconnect the milliammeter, and re-connect the yellow BWO CATHODE lead to terminal C.

Proceed to step (e).

(d) For VTM Units only.

INJECTION ELECTRODE ADJUST.

With the POWER switch in the OFF position, connect a voltmeter between the cathode and the injection electrode of the VTM (terminals A and D respectively), the cathode being negative.

CAUTION: FOR THIS ADJUSTMENT, SPECIAL CARE MUST BE EXERCISED AS BOTH THE VOLTMETER AND THE ADJUSTMENT ARE AT KILOVOLT POTENTIAL.

Turn the POWER switch to R.F. ON and wait for the delay to expire. Using an INSULATED SCREWDRIVER, adjust R819 "INJECTION ELECTRODE ADJUST" (see Figure 3) to obtain the voltage specified by the tube manufacturer as shown at the front of this manual. Ensure that this manual refers to the particular VTM installed.

Switch off completely and disconnect the voltmeter.

(e) LEVEL BALANCE

Note: This adjustment is to be made with an external directional coupler and detector.

Connect SWEEP OUTPUT to the horizontal input terminal of the oscilloscope, and the detected R.F. OUTPUT to the vertical amplifier.

Set R.F. LEVEL fully CCW and SWEEP MODE selector to $f_1 - f_2$. Set f_1 fully CCW. Set R.F. LEVELLER switch to XTAL EXT.

Turn the POWER switch to R.F. ON and wait for the delay to expire.

Adjust R936 "LEVEL BALANCE" until no R.F. output is visible.

CAUTION: WITH THE POWER SWITCH IN THE "R.F. ON" POSITION, KILOVOLT POTENTIALS ARE APPLIED TO THE MICROWAVE TUBE. ALTHOUGH THE FOLLOWING ADJUSTMENTS THEMSELVES ARE NOT AT HIGH POTENTIAL, CARE MUST BE EXERCISED TO AVOID ACCIDENTAL CONTACT WITH POINTS OF HIGH POTENTIAL INSIDE THE UNIT.

(f) LEVEL SET

Note: This adjustment should be disregarded for units which do not have internal levelling components.

Turn the R.F. LEVELLER switch to XTAL INT. and turn R.F. LEVEL fully CW. Adjust R937 "LEVEL SET" so that the R.F. amplitude is just levelled at its maximum value.

(g) R.F. LEVEL MIN.

Note: This adjustment should be disregarded for units which do not have internal levelling components.

Adjust the R.F. LEVEL control so that the display is just levelled across the full band.

Insert a 6dB pad between the R.F. output and the indicating device and note the R.F. level displayed.

Remove the 6dB pad and turn the R.F. LEVEL control fully CCW.

Adjust R966 "R.F. LEVEL MIN." so that the R.F. output level displayed is equal to the level observed with the 6dB pad inserted.

(h) Preliminary LOW FREQUENCY ADJUST

Note: For units which do not have internal levelling components, turn the R.F. LEVELLER switch to the OFF position. For units having internal levelling components, leave the R.F. LEVELLER set to XTAL INT.

Set the R.F. LEVEL control so that the output is just levelled across the full sweep range for levelled units, or fully CW for un-levelled units.

Connect the Frequency Meter as shown in Figure 2 b.

Set M1 to the first calibrated line appearing at the left hand end of the frequency scale.

Set the Frequency Meter to the frequency indicated by the M1 pointer.

Adjust R848 "LOW FREQUENCY ADJUST" so that the M1 and Frequency Meter pulses on the oscilloscope coincide.

(j) Preliminary HIGH FREQUENCY 1 ADJUST

Set M2 to the last calibrated line appearing at the right hand end of the main frequency scale. Set the Frequency Meter to the frequency indicated by M2. Adjust R849 "HIGH FREQUENCY 1 ADJUST" so that the two indications coincide.

For BWO units, proceed to step (k).

For VTM units, proceed to step (1).

(k) Final ANODE VOLTAGE/CATHODE CURRENT ADJUST.

For BWO units only, step (c) should be repeated with the controls set as indicated in the chart, Figure 1.

(l) Final LOW FREQUENCY ADJUST

Repeat step (h) with the controls set as indicated in the chart, Figure 1.

(m) Final HIGH FREQUENCY 1 ADJUST

Repeat step (j).

(n) HIGH FREQUENCY 2 ADJUST

Set SWEEP MODE switch to SYM. M1.

Set M1 and f_2 at the last calibrated line at the right hand end of the frequency scale. Set the Frequency Meter to the frequency indicated by f_2.

Adjust R850 "HIGH FREQUENCY 2 ADJUST" so that the two indications coincide.

(o) HV CLAMP ADJUST

Set SWEEP MODE switch to f_1 - f_2.

Set M1 at the first calibrated line at the left hand end of the frequency scale, and set M2 at the last calibrated line at the right hand end.

Set f_1 fully CCW and f_2 fully CW.

Adjust R916 "HV CLAMP ADJUST" so that the range of frequency sweep just reaches the high frequency marker, M2.

(p) LV CLAMP ADJUST

With all controls set as in step (o), adjust R844 "LV CLAMP ADJUST" so that the range of frequency sweep just reaches the low frequency marker, M1.

SECTION 8

TUBE REPLACEMENT

CAUTION: Before proceeding with the tube replacement, prepare a work space free from materials which can be magnetized so as to avoid mishaps due to the high magnetic field associated with the microwave tube.

It is advisable to remove watches to a safe distance, even if they are claimed to be anti-magnetic.

1.1 (a) Remove the Oscillator Unit from the Basic Unit and take off its top and bottom covers.

(b) Disconnect the tube RF output connection.

(c) Disconnect the microwave tube power leads from the terminal board.

(d) Remove the screws securing the printed circuit board to the chassis, carefully lift the board away sufficiently to gain access to the four tube securing screws and remove the tube.

(e) Place the new tube on the mounting plate and tighten the mounting screws. Re-mount the printed circuit board.

(f) Connect the tube RF connection.

(g) If the entire equipment is to be calibrated at this time, DO NOT CONNECT THE MICROWAVE TUBE POWER LEADS, but first calibrate the Basic Unit 6600 and connect the microwave tube only when required by the calibration procedure. (For electrode connections, refer to Figure 3 for BWO's and Figure 4 for VTM's).

(h) Enter at the front of this manual the serial number and the values of the operating parameters of the new tube in place of the ones pertaining to the tube just replaced.

(j) All adjustments in the Oscillator Unit should be recalibrated starting at step (a) of the Calibration Procedure Section 7 of this manual.

(k) An elapsed-time Indicator is fitted near the rear end of models using a VTM.

It provides a useful running integral of operating hours, may be re-set to zero if desired by passing a current of up to 5mA (in the reverse direction to that indicated by the lead colours) through the element. The time taken to reverse the indicator throughout the whole scale length at 5mA is 2 hours. It is therefore necessary to watch carefully the progress of the electrolyte gap and to cease passing the current when "O" is reached.

The black lead of the indicator is readily accessible, whereas the red lead passes under the high voltage relay and is terminated on one of the relay coil connections near to the rear panel of the Oscillator Unit.

(l) Replace the top and bottom covers.

CONTROL SETTINGS		CALIBRATION STEPS														
		a	b	c	d	e	f	g	h	j	K	l	m	n	o	p
MARKER AMPLITUDE	MID-RANGE								X	X		X	X	X	X	X
	MAX. CCW	X	X	X	X	X	X	X			X					
f_1	MAX. CW	FL	FL	FL	FL						FL			LL		
	MAX. CCW					X	X	X	X	X		X	X		X	X
RF LEVELLER	XTAL. INT.						X	X	X	X		X	X	X	X	X
	XTAL. EXT.					X										
	OFF	X	X	X	X		O	O	O		X	O	O	O	O	O
RF LEVEL	MAX. CW	X	X	X	X		X	*	*	*	X	*	*	*	*	*
	MAX. CCW					X										
SWEEP MODE	$f_1 - f_2$					X	X	X	X	X		X	X		X	X
	f_1	X	X	X	X						X					
	SYM. M_1													X		
POWER	RF OFF	X	X	X	X						X					
	RF ON		↓	↓	↓	X	X	X	X	X	↓	X	X	X	X	X

LEGEND: FL FIRST SCALE CALIBRATION LINE (LOW FREQUENCY)
LL LAST SCALE CALIBRATION LINE (HIGH FREQUENCY)
* AS SPECIFIED IN TEXT
O FOR UNITS WITHOUT INTERNAL LEVELLING COMPONENTS

CALIBRATION - OSCILLATOR UNIT
FIG. 1 CHANGES IN CONTROL SETTINGS

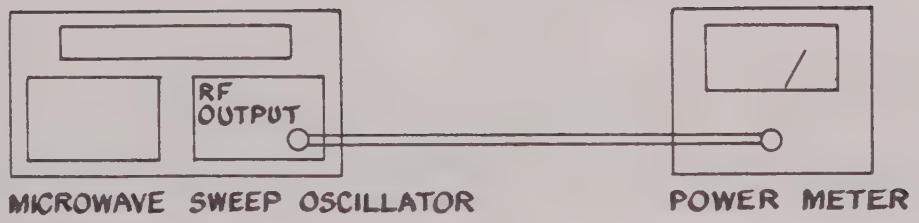


FIG. 2a POWER MEASUREMENT

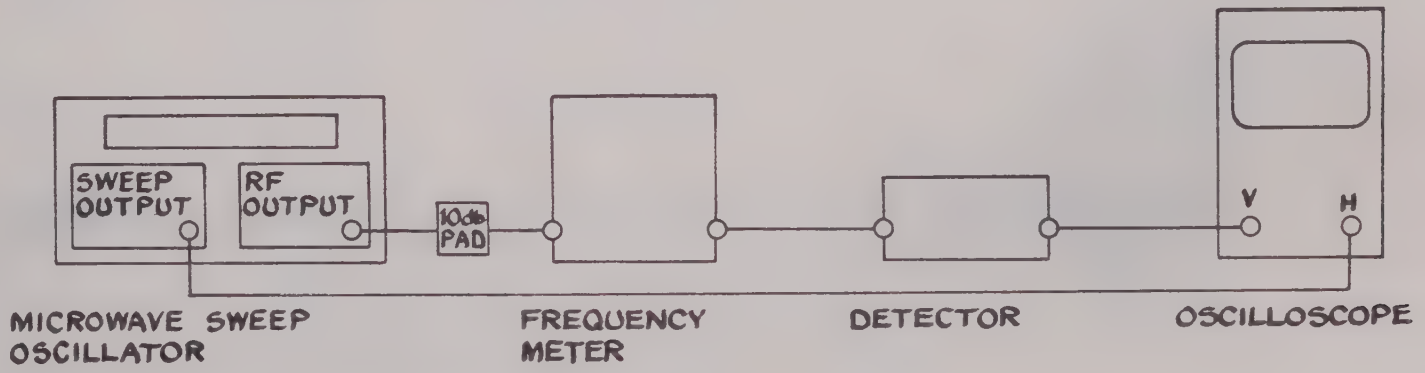


FIG. 2b FREQUENCY MEASUREMENTS

CALIBRATION - OSCILLATOR UNIT

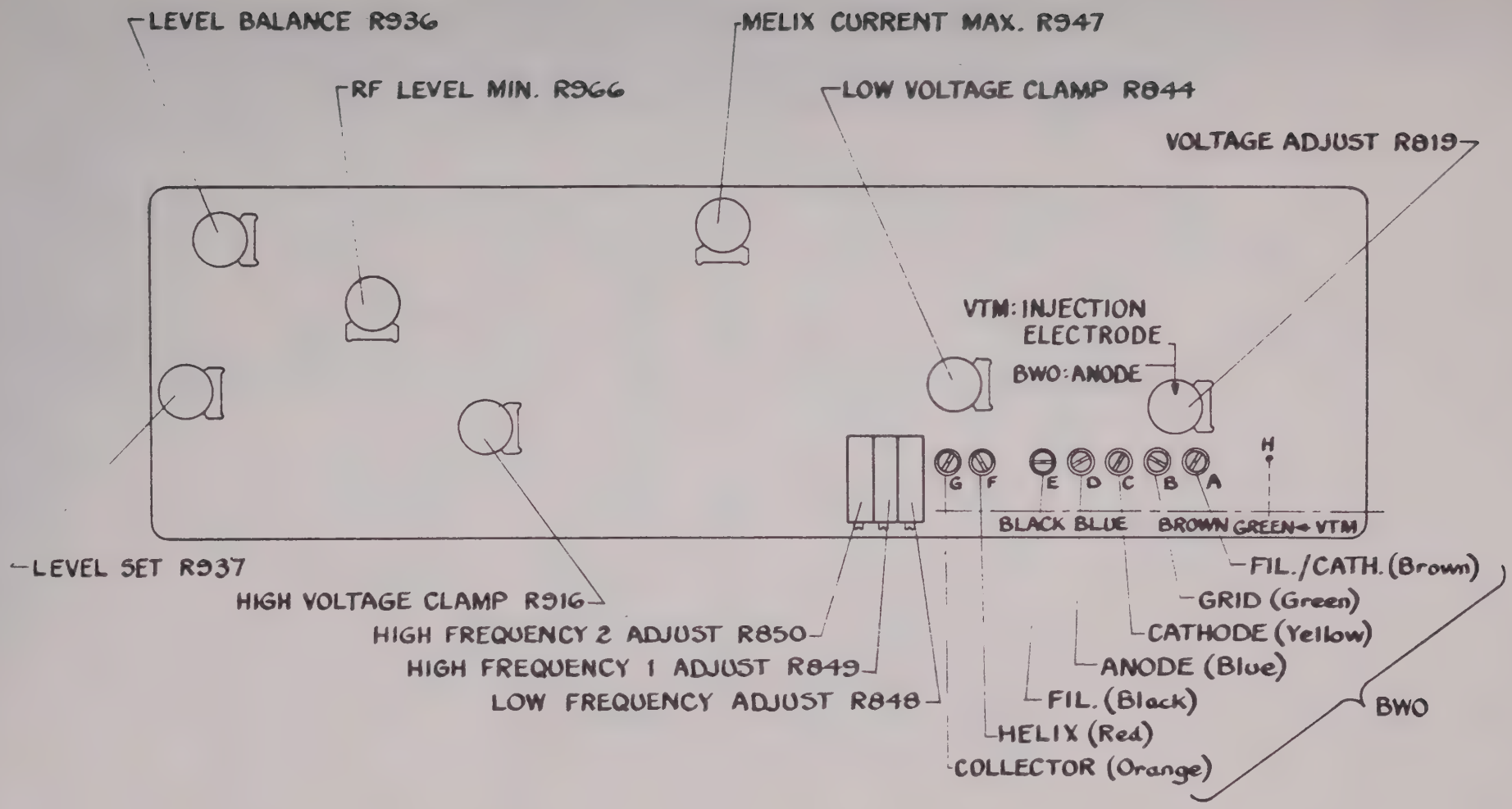


FIG. 3 CALIBRATION ADJUSTMENTS AND TUBE CONNECTIONS

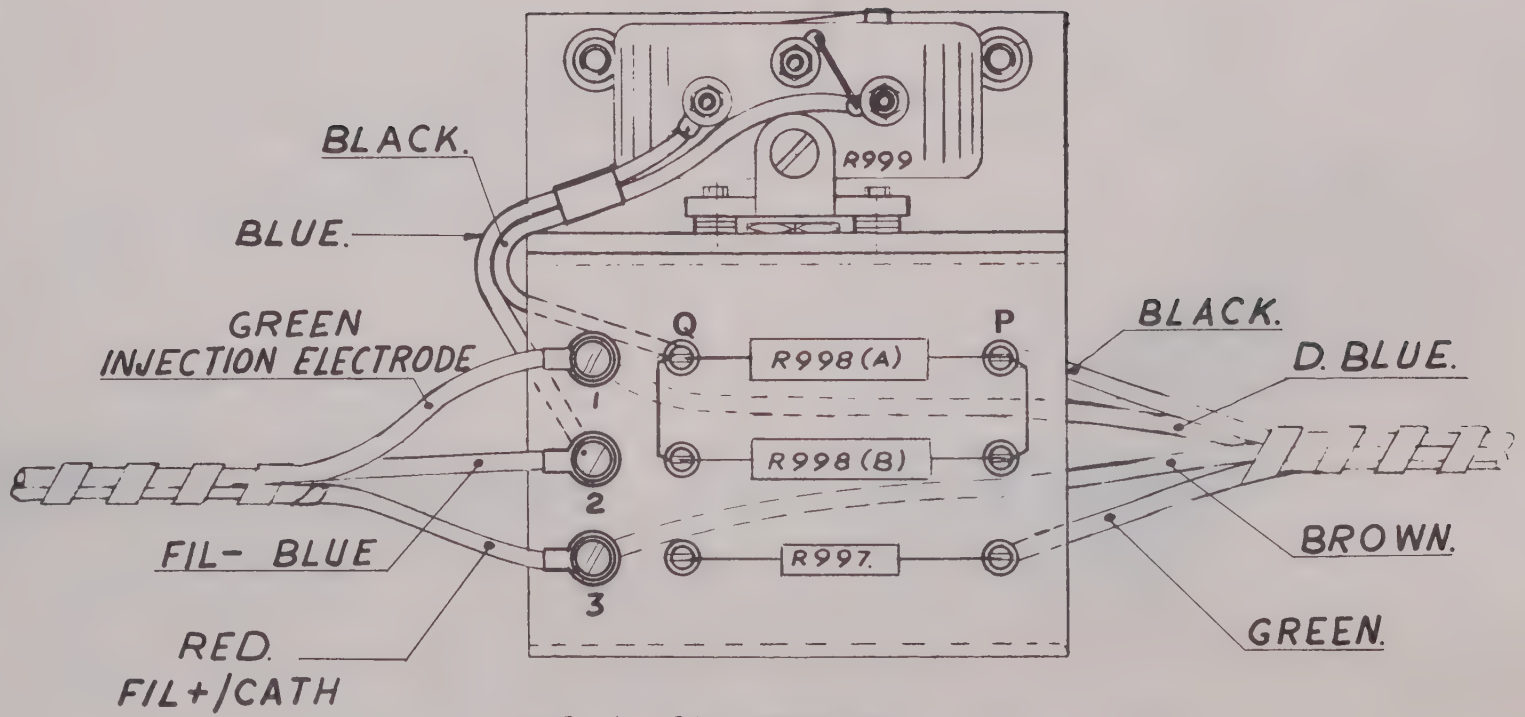


FIG. 4 CALIBRATION

COMPONENT LOCATION FOR VTM UNITS

SPARES ORDERING SCHEDULE

GENERAL LIST

For the complete list of components this list should be read in conjunction with the supplementary one for the specific Oscillator Unit.

Circuit Ref.	Description			
Attenuator				
AT 901	See list for specific unit.			
Capacitors				
C801-805	330pf	± 10%	1KV	Ceramic
C806	10pf	± 10%	350V	Mica
C807	0.0047μf	± 20%	500V	Ceramic
C808	150pF	± 10%	350V	Mica
C809, 810	0.22μF	± 20%	250V	Polyester
C811	See list for specific unit			
C812	See list for specific unit			
C813	0.047μF	± 20%	250V	Polyester
C814	12.5μF	-10+50%	25V	Electrolytic
C815	0.0025μF	GMV	6KV	(Guaranteed Min.Value)
C816*	0.25μF	± 10%	2.5KV	Film, oil-filled
C817*	0.25μF	± 10%	2.5KV	Film, oil-filled
C818*	0.005μF	± 20%	3KV	Ceramic
C819	0.1μF	+ 10%	160V	Polyester
C820	See list for specific unit			
C821	0.01μF	± 20%	250V	Polyester
C822	0.022μF	± 20%	250V	Polyester
C823	100μF	-10+50%	25V	Electrolytic
C824	0.1μF	± 20%	100V	Polyester
C825	0.022μF	± 20%	250V	Polyester
C826	100μF	-10+50%	6.4V	Electrolytic

* (Not used in models 6601 to 6605 (VTM units)

Diodes, Rectifiers		
CR801	1N914	S.T. & C.
CR806	EK600	Electronic Devices Inc.
CR808-820	1N4003	Texas Instruments
CR823	1N4003	" "
CR827	1N4003	" "
CR833	1N914	S.T. & C.
CR834	1N4003	Texas Instruments
CR836	1N914	S.T. & C.
CR837-841	1N4003	Texas Instruments
CR843	1N4003	Texas Instruments
CR845, 846	1N4003	" "
CR847	1N914	S.T. & C.
CR848	1N4003	Texas Instruments
CR849	See list for specific unit	
CR850, 851	IN914	S.T. & C.
CR903, 904	IN914	S.T. & C.
Directional Coupler		
DC. 901	refer to front of manual.	
Diode Modulator		
DM. 901	refer to front of manual.	
Elapsed Time Indicator		
ETI. 901	150 - SS	Miniature Electronic Components
Filter		
FL901	See list for specific unit	
Indicator lamp		
ILP 901	Neon signal lamp, type SGF. 9/A/110/Red	Thorn
Connectors		
J901, 902	BNC socket, type GE35027	Greenpar
J903	BNC socket, type GE35027 (BWO units only)	
PL901	32-way male, type 26-159-32	Amphenol

Circuit Ref.	Description	
Relay		
K901	4PDT, type MK405, 24V d.c. (not used in models 6601 to 6605 inc.)	Keyswitch
Transistors		
Q801	BFY 51	Mullard
Q802	2N3703 or BC213L	Texas Inst.
Q803	2N3703	" "
Q804	2N3707	" "
Q805	2N2913	" "
Q807*	BFY 51	Motorola
Q808*	BCY32	Mullard
Q809	2N3707	"
Q810	BFY51	Texas Inst.
Q812	see list for specific unit	Mullard
Q813	2N3707	
Q814	2N3707	Texas Inst.
Q815	2N3703	" "
Q816	2N3703	" "
Q817	2N3703	" "
Q818	2N3707	" "
Q819	See list for specific unit	" "
Q820	BFY51	
Q821	2N3707	Mullard
Q822	2N3707	Texas Inst.
Q823	2N3707	" "
Q824	2N3702	" "
Q825	2N3703	" "
Q828	2N2913	" "
Q830*	BFY51	Motorola
Q831*	BFY51	Mullard
Q832*	2N3702	"
		Texas Inst.

* Not used in models 6601 to 6605 (VTM units).

Resistors				
R801-810	243K	1%	1W	metal film
R811-813	665K	1%	1W	" "
R815	22 ohms	5%	1/8W	
R816	6.8K	10%	2W	
R817, 818	see list for specific unit			
R819	100K		1/8W	trim-pot, type U-201 C.T.S.
R820	6.8K	10%	1W	
R821	220 ohms	10%	1/4W	
R822	see list for specific unit			
R823	1K	5%	1/8W	
R824-842	see list for specific unit			
R843	400 ohms	1%	1.6W	W.W.
R844	100K		1/8W	trim-pot type U-201 C.T.S.
R845-847	see list for specific unit			
R848	10K	5%	1/2W	multi-turn W.W.
R849, 850	see list for specific unit			
R851	3.3K	5%	1/8W	
R852	1.5K	5%	1/8W	
R853	1K	5%	1/8W	
R854	33K	5%	1/8W	
R855	1K	5%	1/8W	
R856	100 ohms	5%	1/8W	
R857	47K	5%	1/8W	
R858	33K	5%	1/8W	
R859, 860	see list for specific unit			
R861	47K	5%	1/8W	
R862	33K	5%	1/8W	
R863	3.3K	5%	1/8W	
R864	100 ohms	5%	1/8W	
R865	22K	5%	1/8W	
R866	47K	5%	1/8W	
R867	6.8K	5%	1/8W	

Circuit Ref.	Description		
Resistors cont'd.			
R868	10K	5%	1/8W
R869	47 ohms	5%	1/8W
R870	1K	5%	1/8W
R871	see list for specific unit		
R872	1K	5%	1/8W
R875	100 ohms	5%	1/8W
R876	10K	5%	1/8W
R877	1K	5%	1/8W
R878	15K	5%	1/8W
R879	1K	5%	1/8W
R880	10K	5%	1/8W
R881	1K	5%	1/8W
R882	15K	5%	1/8W
R883	330 ohms	5%	1/8W
R884	1K	5%	1/8W
R885	10K	5%	1/8W
R886	4.7K	5%	1/8W
R887	10K	5%	1/8W
R888	6.98K	1%	1/8W metal film
R889	6.98K	1%	1/8W " "
R890	4.7K	5%	1/8W
R891	22K	5%	1/8W
R892	10K	5%	1/8W
R893	6.98K	1%	1/8W metal film
R894	6.98K	1%	1/8W " "
R895	22K	5%	1/8W
R896	2.2K	5%	1/8W
R897	47K	5%	1/8W
R898	10K	5%	1/8W
R899	1K	10%	2W
R900	470 ohms	10%	1W
R901	see list for specific unit		
R902	10K	5%	1/8W
R903	100 ohms	5%	1/8W
R904	4.7K	5%	1/8W
R905	see list for specific unit		
R906	100 ohms	5%	1/8W
R907	4.7K	5%	1/8W
R908	3.3K	10%	1/4W
R909	22K	5%	1/8W
R910	10K	5%	1/8W
R911	10K	5%	1/8W
R912	4.7K	5%	1/8W
R913	68K	5%	1/8W
R914	22K	5%	1/8W
R915	68K	5%	1/8W
R916	2K		1/8W trim-pot, type U-201 C.T.S.
R917	1K	10%	2W
R918	220 ohms	5%	1/8W
R919	100 ohms	5%	1/8W
R920	22K	5%	1/8W
R921	6.8K	10%	2W
R924	15K	5%	1/8W
R925	22K	5%	1/8W
R926	33K	5%	1/8W
R927	20.5K	1%	1/8W metal film
R928	100 ohms	1%	1/8W " "
R929	100 ohms	1%	1/8W " "
R930	2.2K	10%	1/4W
R931	20.5K	1%	1/8W metal film
R932	10K	5%	1/8W
R935	22K	5%	1/8W
R936	1K		1/8W trim-pot, type U-201 C.T.S.
R937	see list for specific unit		
R938	348 ohms	1%	1/8W metal film
R939	1K	5%	1/8W
R940	10K	5%	1/8W
R941	1K	5%	1/8W
R942	220 ohms	5%	1/8W
R943	10M	10%	1/2W
R944-946	120K	5%	16W W.W.
R947, 948*	10M	5%	3/4W, 3KV

Circuit Ref.	Description		
Resistors cont'd.			
R949*	10K	10%	2W
R950*	22 ohms	10%	2W
R951	1.5K		1/4W REV. LOG. VAR.
R952	10K		1/4W LIN. VAR.
R953	10K		1/2W LIN. VAR.
R954-962	see list for specific unit		
R963	100K	5%	1/8W
R964	4.7K	5%	1/8W
R966	2K		1/8W trim-pot, type U-201 C. T. S.
R967	470 ohms	5%	1/8W
R968	1K	5%	1/8W
R969	24.9K	1%	1/8W metal film
R970	46.4K	1%	1/8W " "
R971	4.7K	5%	1/8W
R972	100K	5%	1/8W
R973	22K	5%	1/8W
R974	2K		1/8W trim-pot, type U-201 C. T. S.
R975	47 ohms	5%	1/8W
R976	see list for specific unit		
R977	4.7K	5%	1/8W
R978	12M	5%	1/2W
R979	see list for specific unit		
R997**	2.80K	1%	1/8W metal film
R998**	1.0 ohm	5%	9W W. W.
	see also list for specific unit		
R999**	1.0 ohm		25W LIN. VAR.

* Not used in models 6601 to 6605

** Included in models 6601 to 6605 (VTM units) only.

Switches

S801	SP10T	Rotary switch, drg. No. B. 6601/081
S802	12P 4T	" " " " B. 6601/082
	12P 3T	for models without internal levelling facility.

Tube

V901	Microwave Tube - see front of manual

Zener Diodes

Z802**	1N1799	150V	International Rectifier
Z803, 804	1N1799	150V	" "
Z816	1N753A	6.2V	Transitron
Z817-819	1N759	12.4V	"
Z824	1N753A	6.2V	"
Z825	1N759	12.4V	"
Z826	1N753A	6.2V	"
Z832	1N759	12.4V	"
Z835	1N759	12.4V	"
Z836	1N753A	6.2V	"
Z842	1N753A	6.2V	"
Z844	1N753A	6.2V	"
Z847, 848	1N759	12.4V	"

** Included in models 6601 to 6605 (VTM units) only.

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODEL 6601 Frequency 0.2 - 0.4GHz

AT 901	6dB Pad, Type 6531/2			M.I. Ltd., Sanders Div.
C811	0.0047μF ± 25%		500V	Ceramic
C812	Factory selected			
C820	0.0047μF ± 25%		500V	Ceramic
CR849	IN.914			Mullard
FL901	Not used			
Q807, 808	Not used			
Q812	2N 3703			Texas Inst.
Q819	2N 3707			" "
Q830-832	Not used			
R817	Not used			
R818	100K	1%	1/4W	metal film
R822	Not used			
R824-842	Not used			
R845	Jumper			
R846	Jumper			
R847	35.7K	1%	1/8W	metal film
R849	10K		1/2W	multi-turn W.W.
R850	10K		1/2W	" " " "
R859	27.4K	1%	1/8W	metal film
R860	22.8K	1%	1/8W	" "
R871	3.3K	5%	1/8W	
R901	348 ohms	1%	1/8W	metal film
R905	Jumper			
R937	Not used			
R954	17.4 ohms	1%	1/8W	metal film
R955	34.8 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	174 ohms	1%	1/8W	" "
R958	348 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.74K	1%	1/8W	" "
R961	3.48K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	Jumper			
R979	470 ohms	10%	1W	
R998	0.5 ohms (2 x 1.0 ohm, 5%, 9W in parallel)			

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODEL 6602 Frequency 0.25 - 0.50GHz

AT 901	6dB Pad, Type 6531/2			M.I. Ltd., Sanders Div.
C811	0.0047 μF $\pm$ 25%		500V	Ceramic
C812	Factory selected			
C820	0.0047 μF $\pm$ 25%		500V	Ceramic
CR849	IN914			Mullard
FL901	Not used			
Q807, 808	Not used			
Q812	2N 3703			Texas Inst.
Q819	2N 3707			" "
Q830-832	Not used			
R817	Not used			
R818	75.0K	1%	1/4W	metal film
R822	Not used			
R824-842	Not used			
R845	Jumper			
R846	Jumper			
R847	32.4K	1%	1/8W	metal film
R849	2K		1/2W	multi-turn W.W.
R850	2K		1/2W	" " " "
R859	19.1K	1%	1/8W	metal film
R860	16.2K	1%	1/8W	" "
R871	3.3K	5%	1/8W	
R901	1.5K	5%	1/8W	
R905	Jumper			
R937	Not used			
R954	14.0 ohms	1%	1/8W	metal film
R955	28.0 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	140 ohms	1%	1/8W	" "
R958	280 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.40K	1%	1/8W	" "
R961	2.80K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	Jumper			
R979	470 ohms	10%	1W	
R998	0.5 ohms (2 x 1.0 ohm, 5% 9W in parallel)			

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODEL 6603 Frequency 0.35 - 0.70GHz

AT 901	6dB Pad, Type 6531/2			M.I. Ltd., Sanders Div.
C811	0.0047 μF ± 25%		500V	Ceramic
C812	Factory selected			
C820	0.0047 μF ± 25%		500V	Ceramic
CR849	IN 914			Mullard
FL901	Not used			
Q807, 808	Not used			
Q812	2N 3703			Texas Inst.
Q819	2N 3707			" "
Q830-832	Not used			
R817	Not used			
R818	Jumper			
R822	Not used			
R824-842	Not used			
R845	Jumper			
R846	Jumper			
R847	35.7K	1%	1/8W	metal film
R849	10K		1/2W	multi-turn W.W.
R850	10K		1/2W	" " " "
R859	11.8K	1%	1/8W	metal film
R860	9.09K	1%	1/8W	" "
R871	3.3K	5%	1/8W	
R901	1.87K	1%	1/8W	metal film
R905	Jumper			
R937	Not used			
R954	14.0 ohms	1%	1/8W	metal film
R955	28.0 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	140 ohms	1%	1/8W	" "
R958	280 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.40K	1%	1/8W	" "
R961	2.80K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	Jumper			
R979	470 ohms	10%	1W	
R998	0.5 (2 x 1.0 ohm, 5%, 9W parallel)			

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODEL 6604 Frequency 0.4 - 1.2GHz

AT 901	6dB Pad, Type 6531/2			M.I. Ltd., Sanders Div.
C811	0.0047 μF $\pm$ 25%		500V	Ceramic
C812	Factory selected			
C820	0 0047 μF $\pm$ 25%		500V	Ceramic
CR849	IN914			Mullard
FL901	Not used			
Q807, 808	Not used			
Q812	2N3703			Texas Inst.
Q819	2N3707			Texas Inst.
Q830-832	Not used			
R817	Not used			
R818	100K	1%	1/4W	metal film
R822	Not used			
R824-842	Not used			
R845	Jumper			
R846	Jumper			
R847	40.2K	1%	1/8W	metal film
R 849	2K		1/2W	multi-turn W. W.
R850	2K		1/2W	multi-turn W. W.
R859	15.4K	1%	1/8W	metal film
R860	12.7K	1%	1/8W	" "
R871	3.3K	5%	1/8W	
R901	348 ohms	1%	1/8W	metal film
R905	Jumper			
R937	Not used			
R954	17.4 ohms	1%	1/8W	metal film
R955	34.8 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	174 ohms	1%	1/8W	" "
R958	348 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.74K	1%	1/8W	" "
R961	3.48K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	Jumper			
R979	470 ohms	10%	1W	
R998	0.5 ohm (2 x 1.0 ohm, 5%, 9W, in parallel)			

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODEL 6605 Frequency 0.5 - 1.0GHz

AT 901	6dB Pad, Type 6531/2			M.I. Ltd., Sanders Div.
C811	0.0047 μF $\pm$ 25%		500V	Ceramic
C812	Factory selected			
C820	0.0047 μF $\pm$ 25%		500V	Ceramic
CR849	IN914			Mullard
FL901	Not used			
Q807, 808	Not used			
Q812	2N 3703			Texas Inst.
Q819	2N 3707			" "
Q830-832	Not used			
R817	Not used			
R818	150K	1%	1/4W	metal film
R822	Not used			
R824-842	Not used			
R845	Jumper			
R846	Jumper			
R847	32.4K	1%	1/8W	metal film
R849	10K		1/2W	multi-turn W.W.
R850	10K		1/2W	" " " "
R859	11.8K	1%	1/8W	metal film
R860	9.09K	1%	1/8W	" "
R871	3.3K	5%	1/8W	
R901	1K	5%	1/8W	
R905	Jumper			
R937	Not used			
R954	14.0 ohms	1%	1/8W	metal film
R955	28.0 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	140 ohms	1%	1/8W	" "
R958	280 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.40K	1%	1/8W	" "
R961	2.80K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	Jumper			
R979	470 ohms	10%	1W	
R998	0.5 ohm (2 x 1.0 ohm, 5%, 9W in parallel)			

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODELS 6608 - 6611 Frequency 1.0 - 2.0GHz

AT 901	Not used			
C811	0.0022 μF	± 20%	500V	Ceramic
C812	Factory selected			
C820**	0.0047 μF	± 25%	500V	Ceramic
CR849**	IN914			Mullard
CR901, 902*	IN914			Mullard
FL901	Not used			
Q812**	2N 3703			Texas Inst.
Q819**	2N 3707			Texas Inst.
R817	3.16K	1%	1/8W	metal film
R818	66.5K	1%	1/4W	" "
R822	147 ohms	1%	1.6W	W.W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	80.6K			
R834	100K	1%	1/8W	metal film
R835	Omit	1%	1/8W	" "
R836	60.4K	1%	1/8W	" "
R837	100K	1%	1/8W	" "
R838	100K			
R839	14.7K	1%	1/8W	metal film
R840	56.2K	1%	1/8W	" "
R841	Not used			
R842	Not used			
R845	47K	5%	1/8W	
R846	16.5K	1%	1/8W	metal film
R847	49.9K	1%	1/8W	" "
R849	2K		1/2W	multi-turn W.W.
R850	2K		1/2W	multi-turn W.W.
R859	18.7K	1%	1/8W	metal film
R860	15.4K	1%	1/8W	" "
R871	6.8K	5%	1/8W	
R901	1.96K	1%	1/8W	metal film
R905 †	1K	5%	1/8W	
R937	100 ohms		1/8W	trim-pot type U-201, C.T.S.
R954	17.4 ohms	1%	1/8W	metal film
R955	34.8 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	174 ohms	1%	1/8W	" "
R958	348 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.74K	1%	1/8W	" "
R961	3.48K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	1K	5%	1/8W	
R979**	470 ohms	10%	1W	

** Models 6610 and 6611 only (diode levelled)

† R905 replaced by jumper in 6610 and 6611

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODELS 6612 - 6615 Frequency 1.4 - 2.5GHz

AT 901	Not used			
C811	0.0022 μF $\pm$ 20%		500V	Ceramic
C812	Factory selected			
C820**	0.0047 μF $\pm$ 25%		500V	Ceramic
CR849**	IN914			Mullard
CR901, 902*	IN914			Mullard
FL901	Not used			
Q812**	2N.3703			Texas Inst.
Q819**	2N.3707			" "
R817	3.16K	1%	1/8W	metal film
R818	Jumper			
R822	215 ohms	1%	1.6W	W.W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	30.1K	1%	1/8W	" "
R834	100K	1%	1/8W	" "
R835	Not used			
R836	44.2K	1%	1/8W	metal film
R837	Not used			
R838	100K	1%	1/8W	metal film
R839	75K	1%	1/8W	" "
R840	Not used			
R841	60.4K	1%	1/8W	metal film
R842	Not used			
R845	33K	5%	1/8W	
R846	15.8K	1%	1/8W	metal film
R847	35.7K	1%	1/8W	" "
R849	2K		1/2W	multi-turn W.W.
R850	2K		1/2W	" " " "
R859	21.0K	1%	1/8W	metal film
R860	18.7K	1%	1/8W	" "
R871	6.8K	5%	1/8W	
R901	2.15K	1%	1/8W	metal film
R905†	1K	5%	1/8W	
R937	100 ohms		1/8W	trim-pot, type U201, C.T.S.
R954	14.0 ohms	1%	1/8W	metal film
R955	28.0 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	140 ohms	1%	1/8W	" "
R958	280 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.40K	1%	1/8W	" "
R961	2.80K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	1K	5%	1/8W	
R979**	470 ohms	10%	1W	

** Models 6614 and 6615 only (diode levelled)

† R905 replaced by jumper in 6614 and 6615

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODELS 6618 - 6619 Frequency 1.7 - 4.2GHz

AT 901	Not used			
C811	0.0022 μF $\pm$ 20%		500V	Ceramic
C812	Factory selected			
C820	0.0047 μF $\pm$ 25%		500V	Ceramic
CR849	IN914			Mullard
CR901, 902*	IN914			Mullard
FL901*	Type 6067/1			M.I. Sanders
Q812	2N 3703			Texas Inst.
Q819	2N 3707			Texas Inst.
R817	3.16K	1%	1/8W	metal film
R818	100K	1%	1/4W	" "
R822	98 ohms	1%	1.6W	W.W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	Not used			
R834	16.5K	1%	1/8W	metal film
R835	24.9K	1%	1/8W	" "
R836	33.2K	1%	1/8W	" "
R837	46.4K	1%	1/8W	" "
R838	27.4K	1%	1/8W	" "
R839	40.2K	1%	1/8W	" "
R840	46.4K	1%	1/8W	" "
R841	60.4K	1%	1/8W	" "
R842	165K	1%	1/8W	" "
R845	100K	5%	1/8W	
R846	16.9K	1%	1/8W	metal film
R847	80.6K	1%	1/8W	" "
R849	2K		1/2W	multi-turn W.W.
R850	2K		1/2W	multi-turn W.W.
R859	18.7K	1%	1/8W	metal film
R860	15.4K	1%	1/8W	" "
R871	6.8K	5%	1/8W	
R901	1.5K	5%	1/8W	
R905	Jumper			
R937	100 ohms		1/8W	trim-pot, type U-201 C.T.S.
R954	14.0 ohms	1%	1/8W	metal film
R955	28.0 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	140 ohms	1%	1/8W	" "
R958	280 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.40K	1%	1/8W	" "
R961	2.80K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	1K	5%	1/8W	
R979	470 ohms	10%	1W	

* Model 6619 only (internal coupler)

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODELS 6620 - 6623 Frequency 2.0 - 4.0GHz

At 901	Not used			
C811	0.0022 μF $\pm$ 20%		500V	Ceramic
C812	Factory selected			
C820**	0.0047 μF $\pm$ 20%		500V	Ceramic
CR849**	IN914			Mullard
CR901, 902*	IN914			Mullard
FL901*	Type 6067/1			M. I. Sanders
Q812**	2N3703			Texas Inst.
Q819**	2N3707			Texas Inst.
R817	3.16K	1%	1/8W	metal film
R818	100K	1%	1/4W	" "
R822	147 ohms	1%	1.6W	W. W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	Not used			
R834	46.4K	1%	1/8W	metal film
R835	40.2K	1%	1/8W	" "
R836	43.2K	1%	1/8W	" "
R837	60.4K	1%	1/8W	" "
R838	30.1K	1%	1/8W	" "
R839	80.6K	1%	1/8W	" "
R840	46.4K	1%	1/8W	
R841	49.9K	1%	1/8W	" "
R842	Not used			
R845	47K	5%	1/8W	
R846	15.4K	1%	1/8W	metal film
R847	49.9K	1%	1/8W	" "
R849	2K		1/2W	multi-turn W. W.
R850	2K		1/2W	multi-turn W. W.
R859	19.1K	1%	1/8W	metal film
R860	15.8K	1%	1/8W	" "
R871	6.8K	5%	1/8W	
R901	1.96K	1%	1/8W	metal film
R905 †	1K	5%	1/8W	
R937	100 ohms		1/8W	trim-pot, type U-201 C.T.S.
R954	17.4 ohms	1%	1/8W	metal film
R955	34.8 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	174 ohms	1%	1/8W	" "
R958	348 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.74K	1%	1/8W	" "
R961	3.48K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	1K	5%	1/8W	
R979**	470 ohms	10%	1W	

* Models 6621 and 6623 only (internal coupler)

** Models 6622 and 6623 only (diode levelled)

† R905 replaced by jumper in 6622 and 6623

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODELS 6624 - 6627 Frequency 3.5 - 6.75GHz

AT 901	Not used			
C811	0.0022 μF $\pm$ 20%		500V	Ceramic
C812	Factory selected			
C820**	0.0047 μF $\pm$ 20%		500V	Ceramic
CR849**	IN914			Mullard
CR901, 902*	IN914			"
FL901	Type 6067/2			M.I. Sanders
Q812**	2N3703			Texas Inst.
Q819**	2N3707			Texas Inst.
R817	3.16K	1%	1/8W	metal film
R818	100K	1%	1/4W	" "
R822	160 ohms	1%	1.6W	W.W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	69.8K	1%	1/8W	" "
R834	44.2K	1%	1/8W	" "
R835	56.2K	1%	1/8W	" "
R836	40.2K	1%	1/8W	" "
R837	75.0K	1%	1/8W	" "
R838	44.2K	1%	1/8W	" "
R839	56.2K	1%	1/8W	" "
R840	80.6K	1%	1/8W	" "
R841	49.9K	1%	1/8W	" "
R842	Not used			
R845	33K	5%	1/8W	
R846	12.7K	1%	1/8W	metal film
R847	35.7K	1%	1/8W	" "
R849	2K		1/2W	multi-turn W.W.
R850	2K		1/2W	multi-turn W.W.
R859	15.4K	1%	1/8W	metal film
R860	13.0K	1%	1/8W	" "
R871	6.8K	5%	1/8W	
R901	1K	5%	1/8W	
R905 †	1K	5%	1/8W	
R937	1K		1/8W	trim-pot, type U-201 C.T.S.
R954	14.0 ohms	1%	1/8W	metal film
R955	28.0 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	140 ohms	1%	1/8W	" "
R958	280 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.40K	1%	1/8W	" "
R961	2.80K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	1K	5%	1/8W	
R979**	470 ohms	10%	1W	

* Models 6625 and 6627 only (internal coupler)

** Models 6626 and 6627 only (diode levelled)

† R905 replaced by jumper on models 6625 and 6627

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODELS 6630 - 6631 Frequency 3.7 - 8.3GHz

AT 901	Not used			
C811	0.0022 μF $\pm$ 20%		500V	Ceramic
C812	Factory selected			
C820	0.0047 μF $\pm$ 25%		500V	Ceramic
CR849	IN914			Mullard
CR901, 902*	IN914			Mullard
FL901*	Type 6067/3			M. I. Sanders
Q812	2N 3703			Texas Inst.
Q819	2N 3707			Texas Inst.
R817	3.16K	1%	1/8W	metal film
R818	100K	1%	1/4W	" "
R822	137 ohms	1%	1.6W	W. W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	27.4K	1%	1/8W	" "
R834	33.2K	1%	1/8W	" "
R835	33.2K	1%	1/8W	" "
R836	35.7K	1%	1/8W	" "
R837	33.2K	1%	1/8W	" "
R838	80.6K	1%	1/8W	" "
R839	40.2K	1%	1/8W	" "
R840	100K	1%	1/8W	" "
R841	49.9K	1%	1/8W	" "
R842	Not used			
R845	47K	5%	1/8W	
R846	16.5K	1%	1/8W	metal film
R847	56.2K	1%	1/8W	" "
R849	2K		1/2W	multi-turn W. W.
R850	2K		1/2W	multi-turn W. W.
R859	19.1K	1%	1/8W	metal film
R860	16.2K	1%	1/8W	" "
R871	6.8K	5%	1/8W	
R901	1.5K	5%	1/8W	
R905	Jumper			
R937	1K		1/8W	trim-pot, type U-201 C.T.S.
R954	17.4 ohms	1%	1/8W	metal film
R955	34.8 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	174 ohms	1%	1/8W	" "
R958	348 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.74K	1%	1/8W	" "
R961	3.48K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	1K	5%	1/8W	
R979	470 ohms	10%	1W	

* Model 6631 only (internal coupler)

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODELS 6632 - 6635 Frequency 4.0 - 8.0GHz

AT 901	Not used			
C811	0.0022 μF $\pm$ 20%		500V	Ceramic
C812	Factory selected			
C820**	0.0047 μF $\pm$ 25%		500V	Ceramic
CR849**	IN 914			Mullard
CR901, 902*	IN 914			"
FL 901*	Type 6067/3			M. I. Sanders
Q812**	2N 3703			Texas Inst.
Q819**	2N 3707			Texas Inst.
R817	3.16K	1%	1/8W	metal film
R818	100K	1%	1/4W	" "
R822	137 ohms	1%	1.6W	W. W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	19.1K	1%	1/8W	" "
R834	19.1K	1%	1/8W	" "
R835	Not used			
R836	20.5K	1%	1/8W	metal film
R837	60.4K	1%	1/8W	" "
R838	35.7K	1%	1/8W	" "
R839	60.4K	1%	1/8W	" "
R840	66.5K	1%	1/8W	" "
R841	66.5K	1%	1/8W	" "
R842	165K	1%	1/8W	" "
R845	47K	5%	1/8W	
R846	15.4K	1%	1/8W	metal film
R847	56.2K	1%	1/8W	" "
R849	2K		1/2W	multi-turn W. W.
R850	2K		1/2W	multi-turn W. W.
R859	18.2K	1%	1/8W	metal film
R860	15.0K	1%	1/8W	" "
R871	6.8K	5%	1/8W	
R901	1.5K	5%	1/8W	
R905 †	1K	5%	1/8W	
R937	1K		1/8W	trim-pot, type U-201 C. T. S.
R954	17.4 ohms	1%	1/8W	metal film
R955	34.8 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	174 ohms	1%	1/8W	" "
R958	348 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.74K	1%	1/8W	" "
R961	3.48K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	1K	5%	1/8W	
R979**	470 ohms	10%	1W	

* Models 6633 and 6635 only (internal coupler)

** Models 6634 and 6635 only (diode levelled)

† R905 replaced by jumper in 6634 and 6635

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODELS 6636 - 6639 Frequency 7.0 - 11.0GHz

AT 901	Not used			
C811	0.0022 μF $\pm$ 20%		500V	Ceramic
C812	Factory selected			
C820**	0.0047 μF $\pm$ 25%		500V	Ceramic
CR849**	IN 914			Mullard
CR901, 902*	IN 914			"
FL 901*	Type 6067/4			M. I. Sanders
Q812**	2N3703			Texas Inst.
Q819**	2N3707			Texas Inst.
R817	3.16K	1%	1/8W	metal film
R818	100K	1%	1/4W	" "
R822	264 ohms	1%	1.6W	W. W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	56.2K	1%	1/8W	" "
R834	154K	1%	1/8W	" "
R835	69.8K	1%	1/8W	" "
R836	69.8K	1%	1/8W	" "
R837	75.0K	1%	1/8W	" "
R838	Not used			
R839	80.6K	1%	1/8W	metal film
R840	147K	1%	1/8W	" "
R841	80.6K	1%	1/8W	" "
R842	Not used			
R845	47K	5%	1/8W	
R846	21.5K	1%	1/8W	metal film
R847	44.2K	1%	1/8W	" "
R849	2K		1/2W	multi-turn W. W.
R850	2K		1/2W	multi-turn W. W.
R859	32.4K	1%	1/8W	metal film
R860	26.7K	1%	1/8W	" "
R871	6.8K	5%	1/8W	
R901	3.01K	1%	1/8W	metal film
R905 †	1K	5%	1/8W	
R937	1K		1/8W	trim-pot, type U-201 C. T. S.
R954	17.4 ohms	1%	1/8W	metal film
R955	34.8 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	174 ohms	1%	1/8W	" "
R958	348 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.74K	1%	1/8W	" "
R961	3.48K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	1K	5%	1/8W	
R979**	470 ohms	10%	1W	

* Models 6637 and 6639 only (internal coupler)

** Models 6638 and 6639 only (diode levelled)

† R905 replaced by jumper in 6638 and 6639

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODELS 6640 - 6643 Frequency 7.0 - 12.4GHz

AT 901	Not used			
C811	0.0022μF	± 20%	500V	Ceramic
C812	Factory selected			
C820**	0.0047μF	± 25%	500V	Ceramic
CR849**	IN 914			Mullard
CR901, 902*	IN 914			"
FL 901*	Type 6067/4			M.I. Sanders
Q812**	2N 3703			Texas Inst.
Q819**	2N3707			" "
R817	3.16K	1%	1/8W	metal film
R818	75.0K	1%	1/4W	" "
R822	182 ohms	1%	1.6W	W.W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	Not used			
R834	49.9K	1%	1/8W	metal film
R835	66.5K	1%	1/8W	" "
R836	40.2K	1%	1/8W	" "
R837	60.4K	1%	1/8W	" "
R838	86.6K	1%	1/8W	" "
R839	40.2K	1%	1/8W	" "
R840	Not used			
R841	86.6K	1%	1/8W	metal film
R842	Not used			
R845	47K	5%	1/8W	
R846	16.2K	1%	1/8W	metal film
R847	44.2K	1%	1/8W	" "
R849	2K		1/2W	multi-turn W.W.
R850	2K		1/2W	multi-turn W.W.
R859	21.0K	1%	1/8W	metal film
R860	17.4K	1%	1/8W	" "
R871	6.8K	5%	1/8W	
R901	1.96K	1%	1/8W	metal film
R905†	1K	5%	1/8W	
R937	1K		1/8W	Trimpot, type U-201 C.T.S.
R954	14.0 ohms	1%	1/8W	metal film
R955	28.0 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	140 ohms	1%	1/8W	" "
R958	280 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.40K	1%	1/8W	" "
R961	2.80K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	1K	5%	1/8W	
R979**	470 ohms	10%	1W	

* Models 6641 and 6643 only (internal coupler)

** Models 6642 and 6643 only (diode levelled)

† R905 replaced by jumper in Models 6642 and 6643

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODELS 6644 - 6647 Frequency 8.0 - 12.4GHz

AT 901	Not used			
C811	0.0022 μF	± 20%	500V	Ceramic
C812	Factory selected			
C8220**	0.0047 μF	±25%	500V	Ceramic
CR849**	IN 914			Mullard
CR901, 902*	IN 914			
FL 901*	Type 6067/4			M.I. Sanders
Q812**	2N 3703			Texas Inst.
Q819**	2N 3707			Texas Inst.
R817	3.16K	1%	1/8W	metal film
R818	100K	1%	1/4W	" "
R822	300 ohms	1%	1.6W	W.W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	15.8K	1%	1/8W	" "
R834	49.9K	1%	1/8W	" "
R835	75.0K	1%	1/8W	" "
R836	56.2K	1%	1/8W	" "
R837	100K	1%	1/8W	" "
R838	75.0K	1%	1/8W	" "
R839	69.8K	1%	1/8W	" "
R840	154K	1%	1/8W	" "
R841	147K	1%	1/8W	" "
R842	69.8K	1%	1/8W	" "
R845	33K	5%	1/8W	
R846	15.4K	1%	1/8W	metal film
R847	30.1K	1%	1/8W	" "
R849	2K		1/2W	multi-turn W.W.
R850	2K		1/2W	multi-turn W.W.
R859	24.9K	1%	1/8W	metal film
R860	20.5K	1%	1/8W	" "
R871	6.8K	5%	1/8W	
R901	1.96K	1%	1/8W	metal film
R905 †	1K	5%	1/8W	
R937	1K		1/8W	trim-pot, type U-201 C.T.S.
R954	17.4 ohms	1%	1/8W	metal film
R955	34.8 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	174 ohms	1%	1/8W	" "
R958	348 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.74K	1%	1/8W	" "
R961	3.48K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	1K	5%	1/8W	" "
R979**	470 ohms	10%	1W	

* Models 6645 and 6647 only (internal coupler)

** Models 6646 and 6647 only (diode levelled)

† R905 replaced by jumper in 6646 and 6647

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT
MODEL 6648, 6657. Frequency 10.0 - 15.5GHz

AT 901	Not used			
C811	0.0022 μF $\pm$ 20%		500V	Ceramic
C812	Factory selected			
C820**	0.0047 μF $\pm$ 25%		500V	Ceramic
CR849**	IN 914			Mullard
FL 901	Not used			
Q812**	2N 3703			Texas Inst.
Q819**	2N 3707			Texas Inst.
R817	3.16K	1%	1/8W	metal film
R818	60.4K	1%	1/4W	" "
R822	232 ohms	1%	1.6W	W.W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	9.09K	1%	1/8W	" "
R834	330K	5%	1/8W	
R835	40.2K	1%	1/8W	metal film
R836	60.4K	1%	1/8W	" "
R837	46.4K	1%	1/8W	" "
R838	40.2K	1%	1/8W	" "
R839	69.8K	1%	1/8W	" "
R840	60.4K	1%	1/8W	" "
R841	165K	1%	1/8W	" "
R842	Not used			
R845	33K	5%	1/8W	
R846	10.0K	1%	1/8W	metal film
R847	21.0K	1%	1/8W	" "
R849	2K		1/2W	multi-turn W.W.
R850	2K		1/2W	multi-turn W.W.
R859	14.0K	1%	1/8W	metal film
R860	11.8K	1%	1/8W	" "
R871	6.8K	5%	1/8W	
R901	698 ohms	1%	1/8W	metal film
R905†	1K	5%	1/8W	
R937	Not used			
R954	14.0 ohms	1%	1/8W	metal film
R955	28.0 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	140 ohms	1%	1/8W	" "
R958	280 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.40K	1%	1/8W	" "
R961	2.80K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	1K	5%	1/8W	
R979**	470 ohms	10%	1W	

** Not used in grid-levelled model 6648

† R905 replaced by jumper in diode-levelled model 6657

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODEL 6649, 6653 Frequency 12.4 - 18.0GHz

AT 901	Not used			
C811	0.0022 μF $\pm$ 20%		500V	Ceramic
C812	Factory selected			
C820**	0.0047 μF $\pm$ 25%		500V	Ceramic
CR849**	IN 914			Mullard
FL901	Not used			
Q812**	2N 3703			Texas Inst.
Q819**	2N 3707			Texas Inst.
R817	3.16K	1%	1/8W	metal film
R818	75.0K	1%	1/4W	" "
R822	244 ohms	1%	1.6W	W.W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	33.2K	1%	1/8W	" "
R834	40.2K	1%	1/8W	" "
R835	27.4K	1%	1/8W	" "
R836	Not used			
R837	33.2K	1%	1/8W	metal film
R838	60.4K	1%	1/8W	" "
R839	49.9K	1%	1/8W	" "
R840	Not used			
R841	100K	1%	1/8W	metal film
R842	Not used			
R845	33K	5%	1/8W	
R846	10.5K	1%	1/8W	metal film
R847	24.9K	1%	1/8W	" "
R849	2K		1/2W	multi-turn W.W.
R850	2K		1/2W	multi-turn W.W.
R859	15.8K	1%	1/8W	metal film
R860	13.3K	1%	1/8W	" "
R871	6.8K	5%	1/8W	
R901	1.5K	5%	1/8W	
R905†	1K	5%	1/8W	
R937	1K		1/8W	trim-pot, type U-201 C.T.S.
R954	14.0 ohms	1%	1/8W	metal film
R955	28.0 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	140 ohms	1%	1/8W	" "
R958	280 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.40K	1%	1/8W	" "
R961	2.80K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	1K	5%	1/8W	
R979**	470 ohms	10%	1W	

** Not used in grid-levelled model 6649

† R905 replaced by jumper in diode-levelled model 6653

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODEL 6650 Frequency 18.0 - 26.5GHz

AT 901	Not used			
C811	0.0022 μF ± 20%		500V	Ceramic
C812	Factory selected			
C820	Not used			
CR849	Not used			
FL 901	Not used			
Q812**	Not used			
Q819**	Not used			
R817	3.16K	1%	1/8W	metal film
R818	100K	1%	1/4W	" "
R822	348 ohms	1%	1.6W	W.W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	Not used			
R834	121K	1%	1/8W	metal film
R835	33.2K	1%	1/8W	" "
R836	86.6K	1%	1/8W	" "
R837	20.5K	1%	1/8W	" "
R838	46.4K	1%	1/8W	" "
R839	69.8K	1%	1/8W	" "
R840	86.6K	1%	1/8W	" "
R841	33.2K	1%	1/8W	" "
R842	40.2K	1%	1/8W	" "
R845	33K	5%	1/8W	
R846	12.7K	1%	1/8W	metal film
R847	24.9K	1%	1/8W	" "
R849	2K		1/2W	multi-turn W.W.
R850	2K		1/2W	multi-turn W.W.
R859	21.5K	1%	1/8W	metal film
R860	18.2K	1%	1/8W	" "
R871	6.8K	5%	1/8W	
R901	1.5K	5%	1/8W	
R905	1K	5%	1/8W	
R937	Not used			
R954	17.4 ohms	1%	1/8W	metal film
R955	34.8 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	174 ohms	1%	1/8W	" "
R958	348 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.74K	1%	1/8W	" "
R961	3.48K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	1K	5%	1/8W	" "
R979	Not used			

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT

MODEL 6651 Frequency 26.5 - 40.0GHz

AT 901	Not used			
C811	0.0022 μF $\pm$ 20%		500V	Ceramic
C812	Factory selected			
C820	Not used			
CR849	Not used			
FL 901	Not used			
Q812	Not used			
Q819	Not used			
R817	3.16K	1%	1/8W	metal film
R818	100K	1%	1/4W	" "
R822	332 ohms	1%	1.6W	W.W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	20.5K	1%	1/8W	" "
R834	20.5K	1%	1/8W	" "
R835	69.8K	1%	1/8W	" "
R836	33.2K	1%	1/8W	" "
R837	60.4K	1%	1/8W	" "
R838	46.4K	1%	1/8W	" "
R839	66.5K	1%	1/8W	" "
R840	121K	1%	1/8W	" "
R841	40.2K	1%	1/8W	" "
R842	49.9K	1%	1/8W	" "
R845	Jumper			
R846	13.3K	1%	1/8W	metal film
R847	24.9K	1%	1/8W	" "
R849	2K		1/2W	multi-turn W.W.
R850	2K		1/2W	multi-turn W.W.
R859	21.5K	1%	1/8W	metal film
R860	18.7K	1%	1/8W	" "
R871	6.8K	5%	1/8W	
R901	1.5K	5%	1/8W	
R905	1K	5%	1/8W	
R937	Not used			
R954	17.4 ohms	1%	1/8W	metal film
R955	34.8 ohms	1%	1/8W	" "
R956	69.8 ohms	1%	1/8W	" "
R957	174 ohms	1%	1/8W	" "
R958	348 ohms	1%	1/8W	" "
R959	698 ohms	1%	1/8W	" "
R960	1.74K	1%	1/8W	" "
R961	3.48K	1%	1/8W	" "
R962	6.98K	1%	1/8W	" "
R976	1K	5%	1/8W	
R979	Not used			

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT
MODEL 6658 FREQUENCY 4.8 – 9.7 GHz

AT 901	Not used			
C811	0.0022μF $\pm$ 20%		500V	Ceramic
C812	Factory selected			
C820	Not used			
CR849	Not used			
FL 901	Not used			
Q812	Not used			
Q819	Not used			
R817	3.16K	1%	1/8W	metal film
R818	66.5K	1%	1/4W	metal film
R822	160 ohms	1%	1.6W	W.W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833-834	Not used			
R835	22.8K	1%	1/8W	metal film
R836	60.4K	1%	1/8W	metal film
R837	40.2K	1%	1/8W	metal film
R838	40.2K	1%	1/8W	metal film
R839	40.2K	1%	1/8W	metal film
R840	49.9K	1%	1/8W	metal film
R841	40.2K	1%	1/8W	metal film
R842	121K	1%	1/8W	metal film
R845	47K	5%	1/8W	metal film
R846	11.8K	1%	1/8W	metal film
R847	49.8K	1%	1/8W	metal film
R849	2K		1/2W	multi-turn W.W.
R850	2K		1/2W	multi-turn W.W.
R859	15.0K	1%	1/8W	metal film
R860	12.7K	1%	1/8W	metal film
R871	6.8K	5%	1/8W	
R901	1.5K	5%	1/8W	
R905	1K	5%	1/8W	
R937	Not used			
R954	17.4 ohms	1%	1/8W	metal film
R955	34.8 ohms	1%	1/8W	metal film
R956	69.8 ohms	1%	1/8W	metal film
R957	174 ohms	1%	1/8W	metal film
R958	348 ohms	1%	1/8W	metal film
R959	698 ohms	1%	1/8W	metal film
R960	1.74K	1%	1/8W	metal film
R961	3.48K	1%	1/8W	metal film
R962	6.98K	1%	1/8W	metal film
R976	1K	5%	1/8W	
R979	Not used			

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT
MODEL 6667 FREQUENCY 8.0 – 18.0 GHz

AT 901	Not used			
C811	0.0022μF ± 20%		500V	Ceramic
C812	Factory selected			
C820	Not used			
CR849	Not used			
FL901	Not used			
Q812	Not used			
Q819	Not used			
R817	3.16K	1%	1/8W	metal film
R818	100K	1%	1/8W	metal film
R822	137 ohms	1%	1.6W	W.W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	Not used			
R834	Not used			
R835	Not used			
R836	9.09K	1%	1/8W	metal film
R837	16.9K	1%	1/8W	metal film
R838	13.0K	1%	1/8W	metal film
R839	32.4K	1%	1/8W	metal film
R840	22.8K	1%	1/8W	metal film
R841	35.7K	1%	1/8W	metal film
R842	56.2K	1%	1/8W	metal film
R845	47K	5%	1/8W	
R846	15.0K	1%	1/8W	metal film
R847	86.6K	1%	1/8W	metal film
R849	2K		1/2W	multi-turn W.W.
R850	2K		1/2W	multi-turn W.W.
R859	17.4K	1%	1/8W	metal film
R860	15.0K	1%	1/8W	metal film
R871	6.8K	5%	1/8W	
R901	1.5K	5%	1/8W	
R905	1K	5%	1/8W	
R937	Not used			
R954	17.4 ohms	1%	1/8W	metal film
R955	34.8 ohms	1%	1/8W	metal film
R956	69.8 ohms	1%	1/8W	metal film
R957	174 ohms	1%	1/8W	metal film
R958	348 ohms	1%	1/8W	metal film
R959	698 ohms	1%	1/8W	metal film
R960	1.74K	1%	1/8W	metal film
R961	3.48K	1%	1/8W	metal film
R962	6.98K	1%	1/8W	metal film
R976	1K	5%	1/8W	metal film
R979	Not used			

Coaxial cable assembly – Drawing No.6667/002
comprising: Bulkhead Feedthrough, OSN 410-1
Omni-Spectra

R.F. Connector, OSM 202-1 Omni-Spectra

Semi-rigid coaxial cable, type RGU141, Amphenol

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT
MODEL 6670 FREQUENCY 15 – 22 GHz

AT 901	Not used			
C811	0.0022μF ± 20%		500V	Ceramic
C812	Factory selected			
C820	Not used			
CR849	Not used			
FL 901	Not used			
Q812	Not used			
Q819	Not used			
R817	3.16K	1%	1/8W	metal film
R818	100K	1%	1/4W	metal film
R822	332 ohms	1%	1.6W	W.W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	20.5K	1%	1/8W	metal film
R834	Not used			
R835	35.7K	1%	1/8W	metal film
R836	22.8K	1%	1/8W	metal film
R837	Not used			
R838	32.4K	1%	1/8W	metal film
R839	Not used			
R840	26.7K	1%	1/8W	metal film
R841	Not used			
R842	100K	1%	1/8W	metal film
R845	Jumper			
R846	13.0K	1%	1/8W	metal film
R847	26.7K	1%	1/8W	metal film
R849	2K		1/2W	multi-turn W.W.
R850	2K		1/2W	multi-turn W.W.
R859	18.2K	1%	1/8W	metal film
R860	15.0K	1%	1/8W	metal film
R871	6.8K	5%	1/8W	
R901	1.5K	5%	1/8W	
R905	1K	5%	1/8W	
R937	Not used			
R954	17.4 ohms	1%	1/8W	metal film
R955	34.8 ohms	1%	1/8W	metal film
R956	69.8 ohms	1%	1/8W	metal film
R957	174 ohms	1%	1/8W	metal film
R958	348 ohms	1%	1/8W	metal film
R959	698 ohms	1%	1/8W	metal film
R960	1.74K	1%	1/8W	metal film
R961	3.48K	1%	1/8W	metal film
R962	6.98K	1%	1/8W	metal film
R976	1K	5%	1/8W	
R979	Not used			

SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT
MODELS 6673, 6674 FREQUENCY 2 – 4.5 GHz

AT 901	Not used			
C811	0.0022μF ± 20%		500V	Ceramic
C812	Factory selected			
C820	0.0047μF		500V	Ceramic
CR849	IN914			
FL901	Not used			
Q812	2N3703			
Q819	2N3707			
R817	3.16K	1%	1/8W	metal film
R818	100K	1%	1/4W	metal film
R822	300 ohms	1%	1.6W	W.W.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	35.7K	1%	1/8W	metal film
R834	Not used			
R835	Not used	1%	1/8W	metal film
R836	100K	1%	1/8W	metal film
R837	80.6K	1%	1/8W	metal film
R838	Not used	1%	1/8W	metal film
R839	100K	1%	1/8W	metal film
R840	80.6K + 80.6K	1%	1/8W	metal film
R841	121K	1%	1/8W	metal film
R842	165K	1%	1/8W	metal film
R845	47K	5%	1/8W	metal film
R846	20.5K	1%	1/8W	metal film
R847	60.5K	1%	1/8W	metal film
R849	2K		1/2W	multi-turn W.W.
R850	2K		1/2W	multi-turn W.W.
R859	15.0K	1%	1/8W	metal film
R860	12.7K	1%	1/8W	metal film
R871	6.8K	5%	1/8W	
R901	1.5K	5%	1/8W	
R905	1K	5%	1/8W	
R937	1K	5%	1/8W	
R954	17.4 ohms	1%	1/8W	metal film
R955	34.8 ohms	1%	1/8W	metal film
R956	69.8 ohms	1%	1/8W	metal film
R957	174 ohms	1%	1/8W	metal film
R958	348 ohms	1%	1/8W	metal film
R959	698 ohms	1%	1/8W	metal film
R960	1.74K	1%	1/8W	metal film
R961	3.48K	1%	1/8W	metal film
R962	6.98K	1%	1/8W	metal film
R976	1K	5%	1/8W	
R979	470 ohms	10%	1W	

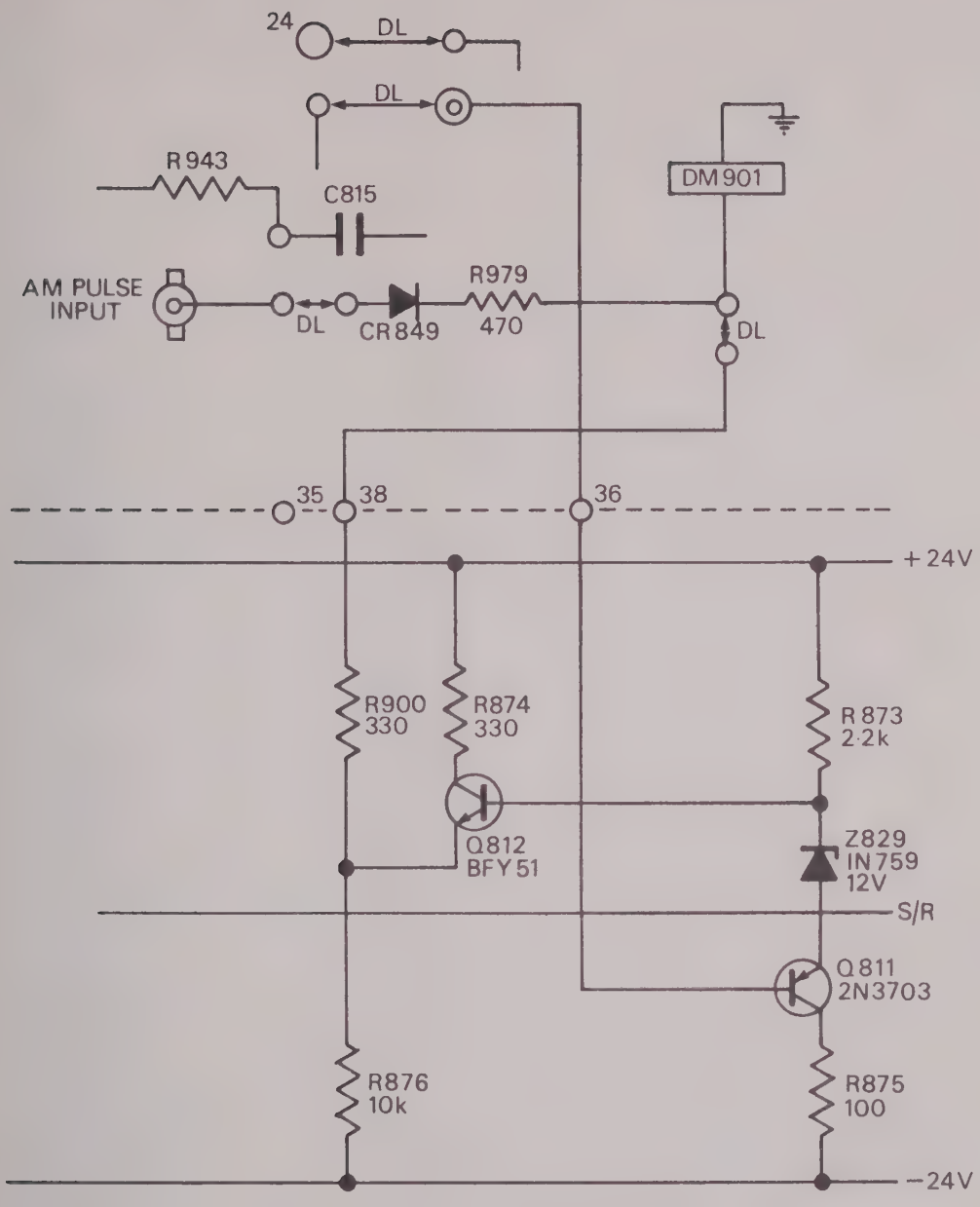
SUPPLEMENTARY COMPONENTS LIST FOR OSCILLATOR UNIT
MODEL 6676 FREQUENCY 7.0 – 13.0 GHz

At 901	Not used			
C811	0.0022μF ± 20%		500V	Ceramic
C812	Factory selected			
C820	Not used			
CR849	Not used			
FL901	Not used			
Q812	Not used			
Q819	Not used			
R817	3.16K	1%	1/8W	metal film
R818	100K	1%	1/8W	metal film
R822	400Ω	1%	1.6W	w.w.
R824-832	40.2 ohms	1%	1/4W	metal film
R833	40.2K	1%	1/8W	metal film
R834	Not used			
R835	147K	1%	1/8W	metal film
R836	221K	1%	1/8W	metal film
R837	Not used			
R838	60.4K	1%	1/8W	metal film
R839	165K	1%	1/8W	metal film
R840	Not used			
R841	Not used			
R842	80.6K	1%	1/8W	metal film
R845	33K	5%	1/8W	
R846	26.7K	1%	1/8W	metal film
R847	69.8K	1%	1/8W	metal film
R849	2K		1/2W	multi-turn w.w.
R850	2K		1/2W	multi-turn w.w.
R859	24.9K	1%	1/8W	metal film
R860	20.5K	1%	1/8W	metal film
R871	6.8K	5%	1/8W	
R901	1.96K	1%	1/8W	metal film
R905	1K	5%	1/8W	
R937	Not used			
R954	17.4 ohms	1%	1/8W	metal film
R955	34.8 ohms	1%	1/8W	metal film
R956	69.8 ohms	1%	1/8W	metal film
R957	174 ohms	1%	1/8W	metal film
R958	348 ohms	1%	1/8W	metal film
R959	698 ohms	1%	1/8W	metal film
R960	1.74K	1%	1/8W	metal film
R961	3.48K	1%	1/8W	metal film
R962	6.98K	1%	1/8W	metal film
R976	1K	5%	1/8W	
R979	Not used			

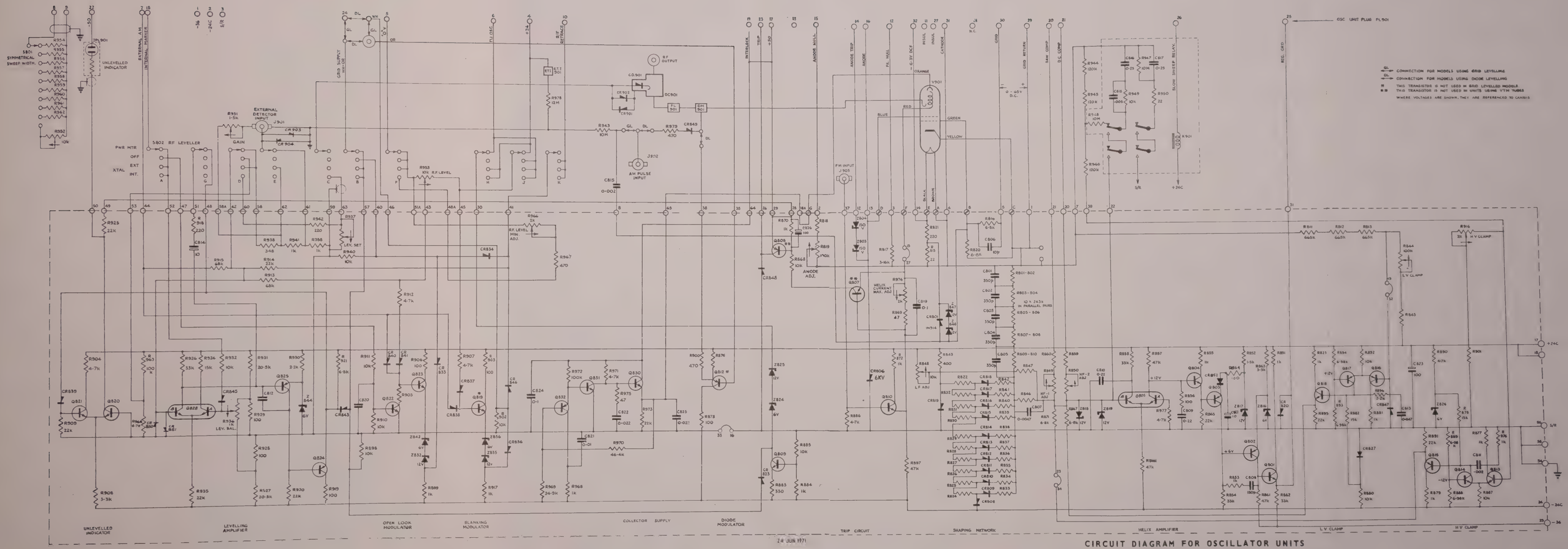
Coaxial cable assembly – Drawing No.6667/002
comprising: Bulkhead Feedthrough, OSN 410-1
Omni Spectra

R.F. Connector, OSM202-1 Omni-Spectra

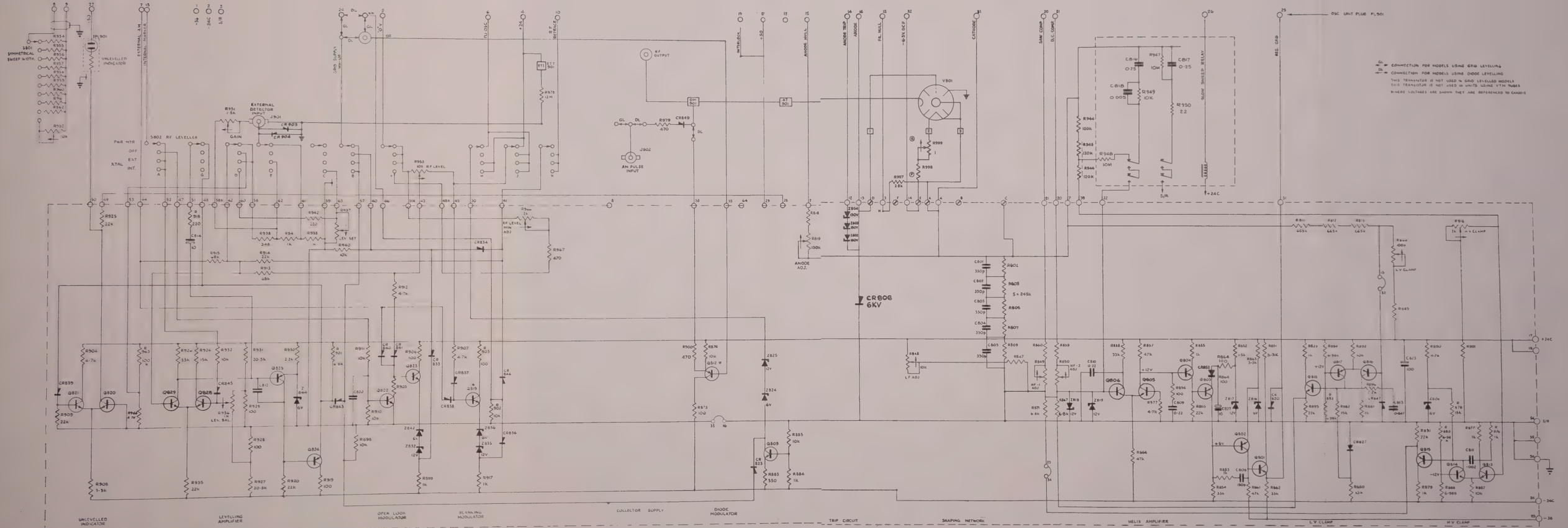
Semi-rigid coaxial cable, type RGU141, Amphenol



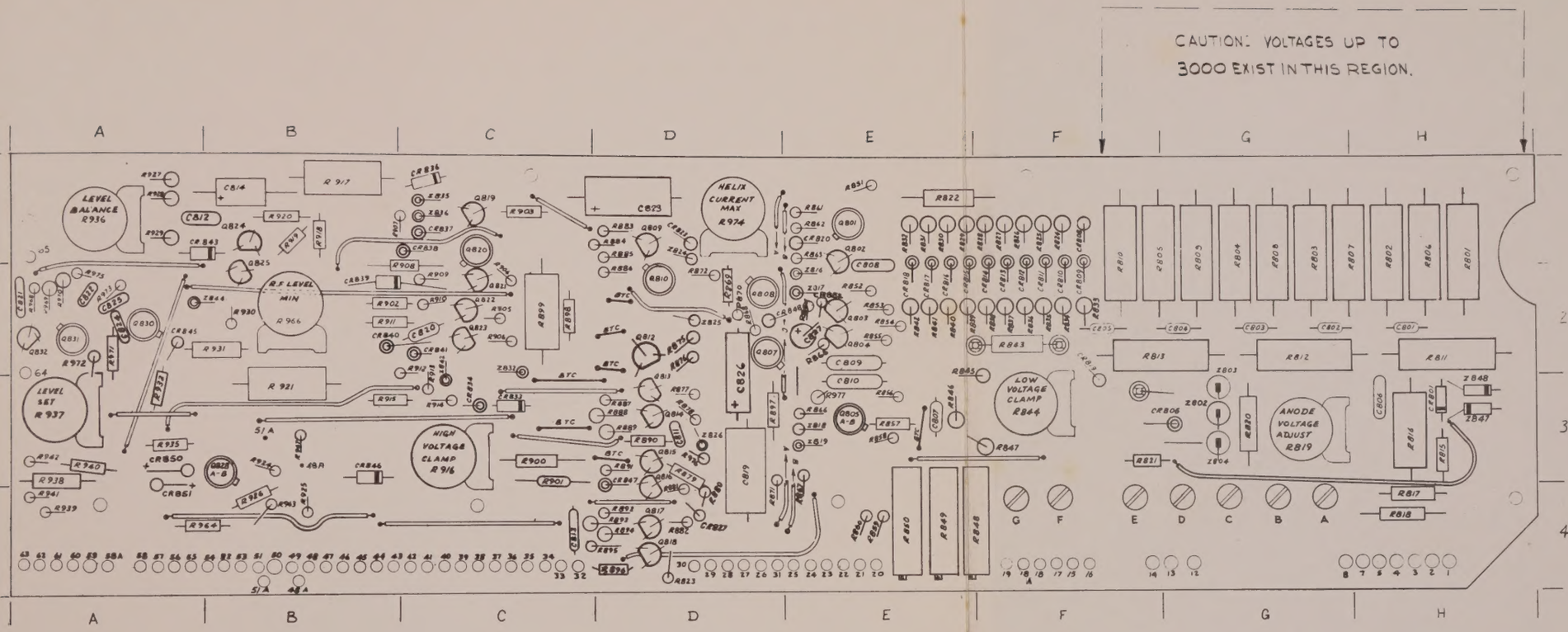
CIRCUIT VARIATION FOR OSCILLATOR UNITS EMPLOYING P.I.N. DIODE MODULATOR TYPE 6053/10



CIRCUIT DIAGRAM FOR OSCILLATOR UNITS
USING A B.W.O. TUBE



CIRCUIT DIAGRAM FOR OSCILLATOR UNITS
USING A V.T.M. TUBE


CAUTION: VOLTAGES UP TO 3000 EXIST IN THIS REGION.
LEVEL BALANCE R936
R.F. LEVEL MIN R966
LEVEL SET R937
HIGH VOLTAGE CLAMP R916
HELIX CURRENT MAX R974
LOW VOLTAGE CLAMP R864
ANODE VOLTAGE ADJUST R819

COMP.	X REF.	COMP.	X REF.	COMP.	X REF.	COMP.	X REF.	COMP.	X REF.	COMP.	X REF.	COMP.	X REF.	COMP.	X REF.	COMP.	X REF.	COMP.	X REF.	COMP.	X REF.	COMP.	X REF.	COMP.	X REF.	COMP.	X REF.	COMP.	X REF.	COMP.	X REF.
R801	H.1.	R825	F1	R849	F4			R897	D.3.	R921	B3			R969	A.2.	C801	H.2.	CR801	H.3.	CR837	D4	Q801	E.1	Q825	B2			Z825	D.2.	C825	A2
R802	H.1.	R826	F1	R850	E4.			R898	C.2.					R970	A.2.	C802	G.2.					Q802	E.1			Z802	G3	Z826	D3.		
R803	G1	R827	F1	R851	E.1.	R875	D2	R899	C.2.					R971	A.2.	C803	G.2.					Q803	E.2.			Z803	G.3.				
R804	G1	R828	F1	R852	E.2.	R876	D2	R900	C3	R924	B.3.			R972	A.2.	C804	G.2.					Q804	E.2	Q818A-B	B.3.	Z804	G.3.				
R805	F1	R829	E1	R853	E.2.	R877	D.3.	R901	C3	R925	B.4.			R973	A.2.	C805	F.2.					Q805A-B	E.3.								
R806	H1	R830	E1	R854	E.2.	R878	D.3	R902	B.2.	R926	B.4.			R974	D.1.	C806	H.3.	CR806	G.3.	CR850	A3			Q830	A.2						
R807	G.1.	R831	E1	R855	E.2.	R879	D.3.	R903	C1.	R927	A.1.			R975	A.2.	C807	E.3.			CR851	A4	Q807	D.2.	Q831	A.2						
R808	G.1.	R832	E1	R856	E3.	R880	D4	R904	C.2.	R928	A.1.			R976	D3	C808	E.1.	CR808	F.1.	CR852	E2	Q808	D.2.	Q832	A.2.			Z832	C.2.		
R809	G.1.	R833	F2	R857	E.3.	R881	D4	R905	C.2.	R929	A.1.			R977	E3	C809	E.2.	CR809	F.1.	CR833	C.3.	Q809	D1.								
R810	F.1.	R834	F2	R858	E.3.	R882	D.4	R906	C.2.	R930	B.2.					C810	E.3.	CR810	F.1.	CR834	C.3.	Q810	D.2								
R811	H.2.	R835	F2	R859	E4.	R883	D.1.	R907	B.1.	R931	B.2.					C811	D.3.	CR811	F.1.									Z835	C.1.		
R812	G.2.	R836	F2	R860	E4	R884	D.1.	R908	C.1.	R932	A3					C812	A1	CR812	F.1.	CR836	C1.	Q812	D.2					Z836	C.1.		
R813	F.2.	R837	F2	R861	E.1.	R885	D.1.	R909	C.2.							C813	C.4.	CR813	F.1.	CR837	C.1	Q813	D.3.								
		R838	F2	R862	E.1.	R886	D.2.	R910	C.2							C814	B.1.	CR814	F.1.	CR838	C.1.	Q814	D.3.								
R815	H.3.	R839	E2	R863	E.1.	R887	D.3.	R911	B.2.	R935	A.3.							CR815	E.1.	CR839	B.2.	Q815	D.3.								
R816	H.3.	R840	E2	R864	E.2.	R888	D.3.	R912	C.2.	R936	A.1.					C826	D3	CR816	E.1.	CR840	B3.	Q816	D.4.			Z816	E.2				
R817	H4	R841	E2	R865	E.2.	R889	D.3.	R913	C.3.	R937	A.3					C82*	E2	CR817	E.1.	CR841	C.2.	Q817	D.4.			Z817	E.2.				
R818	H4	R842	E2	R866	E.3.	R890	D.3.	R914	C.3	R938	A.3.							CR818	E.1.			Q818	D.4.			Z818	E.3	Z842	C.3.		
R819	G.3.	R843	F4.	R867	E3	R891	D.3.	R915	B.3.	R939	A.4.	R963	B.4.			C819	D.3	CR819	F.3.	CR843	B.1	Q819	C.1.			Z819	E.3.				
R820	G.3.	R844	F3	R868	D.2	R892	D.4.	R916	C.3.	R940	A.3	R964	A.4.			C820	C.2.	CR820	E1			Q820	C.1.					Z844	A.2.		
R821	F.3	R845	F2	R869	D.2.	R893	C.4	R917	B.1.	R941	A.4					C821	A.2.			CR845	A1.	Q821	C.2.								
R822	E1	R846	E3	R870	D.2.	R894	D.4.	R918	B.1.	R942	A.3	R966	B.2.			C822	A.2.			CR846	B.3	Q822	C.2.								
R823	D.4.	R847	F3	R871	D.4.	R895	C.4.	R919	B1			R967	B3.			C823	D1	CR823	D1.	CR847	D.4.	Q823	C2.					Z847	H.3.		
R824	F1	R848	F4	R872	D.2.	R896	D4	R920	B.1			R968	A.2			C824	A2			CR848	D2	Q824	B.1.			Z824	D1	Z848	H.3.		

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